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"THE RATE OF CIGARETTE SMOKE IN THE DOG LUNG: NICOTINE AND ASH"

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Nicotine fraction; By a method previously described, cigarette smoke was introduced into the lungs of a dog anesthetized with Pentothal and maintained with artificial respiration. The volume of smoke and its rate of introduction was fixed so that the dog received, on a per kilo body weight basis and per minute of smoking time, approximately the same dose of smoke and nicotine as does the human smoker. Three dose levels were used: the pack-a-day level, the heavy chain-smoker level, and an acute experimental dose which was six times the chain-smoker dose. Some sixty dogs were used in these experiments. At the end of the smoking period, or at 15, 30, or 60 minutes after the smoking period, the dog was terminated, the lungs were removed, and their nicotine content determined by a suitable colorimetric procedure. Results of individual experiments showed a wide variation with considerable overlapping of the dose levels. As a general trend in experiments with the pack-a-day and chain-smoker dose levels, 90 to 98 per cent of the nicotine dose disappeared from the lungs during the smoking period. One hour after the end of the smoking period, the lungs were either nicotine free or contained only 1 or 2 per cent of the total dose. In the series of experiments with the acute experimental dose of smoke some 75 to 95 per cent of the nicotine dose disappeared from the lungs during the smoking period. During the hour following the smoking period the nicotine content of the lungs fell rapidly to about the same level found in those experiments with the human smoker dose of cigarette smoke.

Ash constituents: Cigarette smoke containing radioisotopes has been introduced into the dog lung as a means of indicating the rate of removal of the ash constituents of the smoke from the lung. A comparison of the activity of the smoke introduced into the lungs and of the activity of the lungs after removal from the dog has given a measure of the rate of disappearance of the ash constituents under the conditions studied. Experimental results have been obtained for the isotopes, sodium-24, potassium-42, arsenic-76, and iodine-131. Nearly all of the sodium and potassium, some 85 to 95% of the iodine (used as a "type substance") and 35 to 50% of the arsenic disappeared from the lungs during the smoking period or soon thereafter.

Experimental data on the living animal were secured with the aid of a scintillation counter, so collimated that it registered the activity in a cylindrical field approximately 4 cm. in diameter. In each experiment, the counter was directed at the apices of the upper lobes of the lungs in such a manner that very little, if any, of the activity of the heart or of the trachea was measured. Smoke was introduced into the lungs at a rate which has been termed an acute experimental dose. The activity of the lung field was measured over a period of as much as five hours, during which time as many as five cigarettes were smoked. This technique permits a more detailed analysis of the course of events within the normally functioning lung. Iodine-131 appears to be largely absorbed into the blood stream within a few seconds after the smoke reached the alveoli. The residual deposit leaves the lung more slowly over a period of 30 to 60 minutes.

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