

Effects of Air Ions on Trachea of Primates.* (24997)

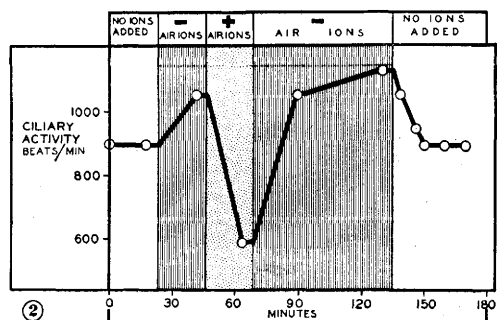
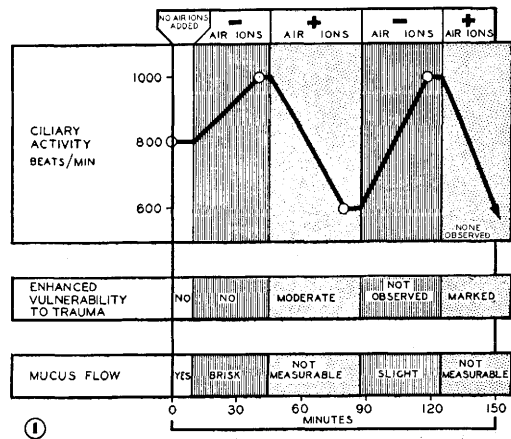
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It has been shown that positive air ions reduce the rates of ciliary beat and mucus flow in the extirpated tracheal strip, while negative ions accelerate both processes(1). Direct administration of positive air ions to tracheal mucosa *via* tracheotomy aperture produces identical inhibition of ciliary activity and in addition increases vulnerability to trauma of mucosal blood vessels. Exposure to negative air ions has the opposite effect(2). Comparable results follow inspiration of air containing relatively large numbers of unipolar air ions by unoperated, ambulatory mice. These effects were observed in rats, mice, guinea pigs and rabbits. In this paper we describe the action of air ions on tracheas of monkeys and man.

Methods. Monkey trachea. Three healthy cynomolgus monkeys were anaesthetized with sodium pentothal. In each case the trachea was carefully exposed, an oblong portion of ventral surface measuring 10 mm by 5 mm was outlined with high frequency desiccating current applicator and then removed with scissors. In 2 instances a copper terminal wound with gauze saturated with Ringer's solution was used as ground of ion generator's rectifying circuit and placed in contact with the trachea just caudal to tracheal window; in one case no ground was used. The monkey's head and thorax were enclosed in glass and plastic chamber to permit microscopic observation of tracheal surface during exposure to air ions in an atmosphere maintained at approximately 25°C with relative humidity Ca. 90%(2). *Tracheal sections* were obtained at autopsy from 2 patients free from respiratory disease and kept in a moist

chamber until used. In one case the time from death to beginning of experiment was 5 hours, and in the other 6½ hours. Strips were cut from the trachea and placed in humid air chamber following technic previously described(1), except that tissue strips were ungrounded. *Small air ions* were generated by beta radiation emitted by tritium contained in sealed foils. A reversible rectifying circuit permitted selection of positive or negative ions (3). Measurements made with Beckett probe and Beckman micromicroammeter established that Ca. 1×10^9 air ions of either charge im-



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FIG. 1. Effects of unipolar small air ions on trachea of living cynomolgus monkey. Ions administered via tracheotomy aperture.

FIG. 2. Effects of unipolar small air ions on extirpated human trachea. (Strips removed post-mortem.)

pinged on each cm² of exposed tissue/second with grounds in place. Ion densities were only slightly less when tissues were ungrounded. Ciliary rates were determined with a strobota-chometer(1).

Results. Fig. 1 typifies results obtained with the 3 monkeys. As is true with mice, rats, guinea pigs and rabbits, negative air ions enhanced the efficiency of the tracheal surface clearing mechanism while positive ions depressed it. In tissues untreated with air ions the minor trauma produced by touching the surface with a probe induced no more than a brief vascular reaction, but after exposure to positive ions this procedure resulted in prompt production of a well-defined ecchymotic area. Grounding the rectifying circuit did not measurably influence the tissue response.

In both human specimens the layer of mu-

cus was minimal and it was not possible to measure rates of mucus flow. However, the characteristic effects of air ions on ciliary activity were well defined in each instance. As indicated in Fig. 2, treatment with negative ions raised rate of beat, and it quickly returned to normal when ion source was removed. Positive ions depressed the rate and this depression was reversible.

Conclusions. Positive air ions depress ciliary activity of trachea of monkeys and man, while negative ions increase it.

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Carcass Weight Changes in Rats Bearing Walker Carcinoma 256. (24998)

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Liver hypertrophy has been frequently observed in tumor-bearing rodents(1) and enlargement was an actual increase in liver substance by nitrogen(2), moisture contents(3) and increased mitotic activity(4). Yeakel(5) suggested that this hypertrophy may be due to increased protein anabolism necessary for neoplastic tissue synthesis. Since liver enlargement occurred when dietary intake was inadequate to furnish the needs of the neoplasm, various tissues relinquished nitrogen to the metabolic pool(2). If these suggestions are correct, partial removal of liver during this period might be expected to inhibit tumor growth and affect changes in carcass weight. In the present experiments, animals were partially hepatectomized during period of rapid tumor growth and changes in body weight as well as tumor growth were followed.

Methods. Female Holtzman rats received intramuscular injections(6) of a suspension of Walker carcinoma 256. Initial weight of animals was 170-190 g. They were fed

Purina laboratory chow and water *ad lib.* Partial hepatectomies (70% of liver removed) were performed by the method of Higgins and Anderson(7) on 7th day of tumor growth when tumors weighed 0.5-2. g. Our preliminary experiments had shown that splenectomy, as well as partial hepatectomy, resulted in larger final liver mass in rats bearing Walker tumor. A splenectomized group was therefore included in the experiments. This operation was performed 2 days before tumor implantation.

Results. Prior to studies on partial hepatectomy, liver weights and carcass weights (total body weight minus tumor weight) were determined in 62 tumor bearers. Animals were sacrificed after 19 days of tumor growth when tumor weights ranged 40-60 g. Fig. 1 shows relation of liver weight to carcass weight changes. Rats with large livers gained carcass weight while those with small livers lost weight and there was a close correlation between those two factors ($r = 0.92$).