

a respiratory alkalo-

edema the which occurs in and cardiac asthma into a severe acidosis respiratory in nature. the concentration of ededly while that of change appreciably. metabolic acidosis with perfusions has effect. In cor pul-stage of hypercapnic ate and pyruvate lev-be modified.

was given by Marianne Tella Tonazzi.

to the Environment, Wash-Physiological Society, 1964.

Lactic Acidosis, Amer J

Berry, M.N.: Splanchnic During Hyperventilation 45:1069, 1966.

W.K.; and Gillies, and Acidosis, Lancet 2:

Metabolic Acidosis in Acute Brit Med J 2:383-385, 1966. and Blount, S.G., Jr.: The Concentration in the Regu-Arterial Pressure, Circulation

Yuan, S.: Response of the to Hypoxia and H-ion J Clin Invest 45:399-411,

Influence of Blood pH on Vasoconstriction, J Appl

Microfilmed 9-30-81

JAN 28 1972

3933

LIBRARY COPY

Effect of Cigarette, Cigar, and Pipe Smoking on Nicotine Excretion

The Influence of Inhaling

Alfred Kershbaum, MD; Samuel Bellet, MD; Masami Hirabayashi, MD; Leonard J. Feinberg, PhD; and Ralph Eilberg, PhD, Philadelphia

IN STUDIES of the relative effect of cigarette, cigar, and pipe smoking on lipid metabolism and catecholamine activity,^{1,2} differences and similarities were observed which were ascribed to the degree of nicotine absorption that occurs with these different forms of smoking. To test the validity of this assumption, the nicotine content of the urine was determined during cigarette, cigar, and pipe smoking in man and dog. The relationship of inhaling during smoking to nicotine excretion was also investigated.

Method of Study

In the human studies, 29 normal male subjects, age 21 to 56, participated. All were habitual smokers of cigarettes, cigars, or pipes, and some used more than one form of tobacco. In the initial series of experiments, each subject smoked four cigarettes (4 gm tobacco), a 4-gm segment of cigar, or 4 gm of pipe tobacco per hour for four hours. The customary methods of smoking were used, of inhaling cigarettes and not inhaling cigars or pipe. The bladder was emptied prior to the start of

smoking, and urine was collected during the smoking period. The last urination was at the end of the four-hour period, smoking being completed 20 minutes before. Urine samples were stored frozen until analyzed for nicotine content. Experiments were started at 9 AM, with no food or smoking permitted for the preceding 12 hours. No food was taken during the experiments but water was given freely. The three smoking forms were tested in random sequence at three-day intervals. To determine if nicotine would appear in the urine from smoking done prior to the 12-hour abstention, control experiments were done in ten random subjects in which four-hour urine collections were made with smoking prohibited. Subjects were supervised during each experiment for accurate timing of urine collections, even distribution of smoking during each hour, and maintenance of noninhalation or uniform depth of inhalation with the different smoking forms.

To determine the influence of inhaling on urinary nicotine excretion, the following additional studies were done in ten subjects. In varied sequence and at three-day intervals, each subject repeated the original experiments except that he inhaled during cigar and pipe smoking and did not inhale during cigarette smoking. Depth of inhalation was kept uniform, and noninhalation was kept constant as in the initial experiments.

In the animal experiments, 11 female mongrel dogs weighing 11 to 14 kg (24.2 to 30.9 lb) were used. With the animals under pentobarbital anesthesia (30 mg/kg), the trachea was intubated and kept airtight, respirations being maintained at a constant rate and volume by a

Received for publication March 21, 1967; accepted May 1.

From the Division of Cardiology, Philadelphia General Hospital, Philadelphia. Dr. Hirabayashi is a research fellow in cardiology.

Reprint requests to Division of Cardiology, Philadelphia General Hospital, 34th St and Curie Ave, Philadelphia 19104 (Dr. Kershbaum).

96960544