was followed by a less marked elevation of the blood pressure (Table 1).

The responses obtained were prolonged, lasting for the duration of the experiment—at least 30 min. In one instance, blood pressure measured by the auscultatory method 1½ hrs later, showed that the rise was maintained.

From these results it can be concluded that desoxycorticosterone acetate, where administered intravenously, acts as a pressor substance in hypertensive individuals.

References

1. PERERA, G. A. *J. A. M. A.*, 1945, **129**, 537.
2. PERERA, G. A., and BLOOD, D. W. *Proc. Amer. Soc. clin. Invest.*, 1947.
3. PERERA, G. A., KNOWLTON, A. I., LOWELL, A., and LOEB, R. F. *J. A. M. A.*, 1944, **125**, 1030.
4. SELYE, F. *Canad. med. J.*, 1947, **54**, 325.
5. SOFFER, L. J. *Disease of the adrenals.* Philadelphia: Lea & Febiger, 1946.

The Nasal Cavity of the Rat in Pharmacological and Other Experimentation

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Investigation of the effects of drugs on the mucous membrane of the nose has been encouraged by the fact that in various laboratory animals the nasal mucous membrane is easily accessible for such study. Furthermore, the effects of drugs can be observed without interference with the function of other vital organs.

The basis for this type of experiment is complete orientation as to (1) the normal anatomy and histology of the animal in question and (2) knowledge of pathologic conditions as they are encountered spontaneously, *i.e.* in the course of normal life under laboratory conditions or in the animal farms of the institutions, without exposure to experimental factors.

It has been felt that the progress of such experimental work requires more data concerning the normal conditions and the "spontaneous" pathologic phenomena. The present study has been made of the rat as one type of laboratory animal readily available and frequently used in experimentation with drugs. In order to obtain data from a cross section of the species, 40 young animals of both sexes and from different, but known, strains of various laboratories were used. Born in the respective laboratories, they had been employed solely for breeding purposes, and their diet had been a normal one, designed to maintain a high standard of general good health. After decapitation, a series of frontal sections were cut through the entire length of the nasal cavity.

Pathologic findings included: in the main cavity, hemorrhage (4 times), excessive mucus (3), excessive fibrin (25), suppuration (22); in the maxillary sinuses, hemorrhage (1), excessive fibrin (6), suppuration (8). In two of the rats in which the main cavity was regarded as normal, pus was found in the maxillary sinuses. Fibrin was designated as excessive on the basis of amount and unusual intensity of round cell activity around and within the meshes. Among others, the following additional pathologic findings were noted: abundance of goblet cells in large areas, cystlike empyemas between roots of turbinals, granulatory masses on the septum, formation of osteophytes by calcification of suppurative masses, foreign bodies probably of plant origin, with collateral inflammatory reactions. In some instances the choanae were completely blocked. With allowance of a wide margin for normal limits, pathologic changes were found in 24 animals (60%) (*2*).

Some anatomical peculiarities were noted of which no reports could be discovered (*1*):

(1) Characteristic of the region of the choanae in the rat is a *window in the septum* of the lower (respiratory) portion of the nasal cavity, representing a confluence of the two inferior meatuses of the respiratory half, immediately behind the vomeronasal organ. This renders any plan, using one nasal airway for experiments while leaving the other intact for comparison, illusory.

(2) Covered by the bifurcating canopy of the terminal laminae which connect the septum of the ethmoid part to the lateral nasal walls, a tentlike antechamber is formed. The nasal opening of the pharyngeal duct is located under this roof. The duct extends forward the length of the ethmoid part between the lower edge of its septum and the secondary (hard) palate. This portion, which may be called the *subseptal duct,* forms a singular connecting tube between the nose and the pharynx. In the region of the septal window, anterior to the nasal orifice of the subseptal duct, a crossroad is formed between (a) the anterior and posterior part of the nasal cavity, (b) the right and left nasal airway, and (c) the nasal and the pharyngeal cavities. The crossway is situated in the very center of the nasal cavity at the boundary of the anterior (respiratory) and posterior (ethmoid) sections. This disposition effects peculiarities of clearance, since secretions must be conveyed from the anterior section posteriorly and from the posterior section anteriorly to reach any outlet. The inadequacy of clearance accounts for the frequency with which foreign bodies tarry in the cavities, with fully developed collateral reactions as evidence of their long stay. Of more consequence is the difficulty in elimination of pathologic secretions. On the other hand, the slowing down of ventilation may be useful from the point of view of the macrosmatic analysis of the gaseous and liquid contents of the nasal cavities.

(3) Massive *lymphoid accumulations* in the mucosa of the two opposite lateral nasal walls mark the region of the anterior orifice of the subseptal duct. Thick cushions of lymph follicles, showing the typical structure, inclusive reticulization of the epithelium, and transmigration of lymphatic elements to the free mucosal surface follow as a solid mass the foremost section of the canal. The presence of lymphoid masses around the anterior orifice—hitherto overlooked—is understood better if one consid-

ers the subseptal duct as a prolonged pharyngeal tube; one is then reminded of the lymphatic ring at the oral entrance of the pharynx. Here a kind of secondary Waldeyer ring is formed inside the nasal cavity.

Each of these animals was apparently in perfect health, yet anatomic peculiarities, together with frequency of nonexperimental pathologic changes, warrant utmost caution in evaluating findings that have been made by comparison with such "blank" or "control" animals.

An intact peripheral olfactory organ is necessary in experimental investigation of, among others, *psychologic phenomena*. In this field of research the rat has acquired an increasingly important role. Among the experiments in question are those dealing with olfactory discrimination in general, in which response with the help of olfactory cues is observed. The organ of smell is used in studying certain special drives or problem-solving behavior—for example, marking the true path of a maze with an olfactory trail. Results won in this way should not be declared valid until it is established by a postmortem histologic analysis that at the time of the experiment the organs in question were functionally normal.

References

1. KELEMEN, G. *Arch. Otolaryng.*, 1947, **45**, 159.
2. KELEMEN, G., and SARGENT, F. *Arch. Otolaryng.*, 1946, **44**, 24.

Sorption of Fumigant Vapors by Soil

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The use of toxic vapors to control such pests as the rat, soil nematode, boll weevil, and louse is well known. Fumigants are also of great value in the control of rodent pests such as the ground squirrel, pocket gopher, rat, prairie dog, and woodchuck, all of which live in underground burrow systems. Research by this laboratory in the control of burrowing rodents made a study of the persistence of toxic gases in the presence of soil highly desirable.

To our knowledge, only one similar experiment has been reported in the literature. Chisholm and Koblitsky (*2*) found that methyl bromide gas was sorbed by soil, the amount ranging from 0 to 41% in 6 hrs, depending on the type and the water content of the soil used. For example, in 1 hr moist clay sorbed approximately 10% of the methyl bromide originally present in the test chamber. This value increased to 17% after 6 hrs. Concentrations of hydrogen cyanide have been found to be reduced by cotton and jute (*6*), by orange fruit and leaves (*1*), and by wheat (*3*). The sorption of methyl bromide by wheat has also been studied (*7*). In addition, Lubatti and Harrison showed that wheat sorbed hydrogen cyanide, ethylene oxide, trichloroacetonitrile, and methyl bromide in a decreasing order of efficiency (*4*). Sorption and the moisture content of the wheat were directly proportional. Finally, the persistence of carbon monoxide in coal mines after explosions is well known.

In the experiments to be reported, known amounts of various toxic gases were introduced into a 628-liter, gas-tight chamber containing several cages freshly loaded with a sandy clay. The metal chamber had two large glass windows and an inner lining of paint which was chemically resistant. The soil had an average moisture content of approximately 11%, and the amount of surface exposed, calculated from the dimensions of the cages, was roughly 13 sq ft. During the first 5 min of each run, the gases were distributed uniformly throughout the chamber with a fan.

Successive samples of chamber air were collected at 10-min intervals for a 1-hr period and analyzed chemically for toxic content. Control experiments for each gas were also run. In these, exactly the same procedure as outlined above was used, except that no soil was placed in the cages which were in the chamber. An attempt was made to have an initial concentration of 5–10 mg of the agent/liter of chamber air in all of the experiments.

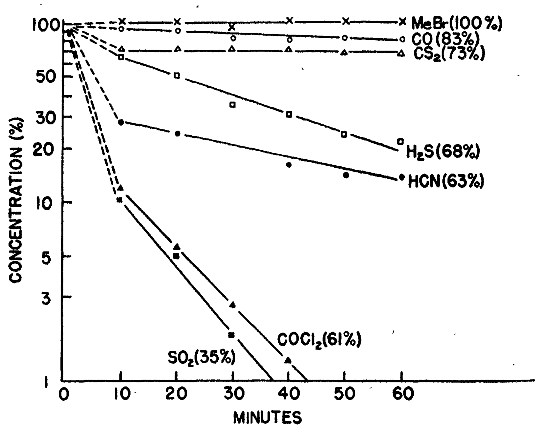

FIG. 1. Effect of soil on the persistence of fumigant vapors. Concentration is expressed as per cent of the original amount of gas calculated to be present in the chamber. The percentage after each of the curves represents the amount of gas present after 1 hr in the no-soil control experiments.

The changes in concentration of the various gases with time, shown in Fig. 1, are the average of four separate runs.

The values in parentheses were obtained in control experiments in which the chamber contained no soil. These represent the percentage of each gas, in terms of the original concentration, which was present in the chamber 1 hr after the gas had been introduced. The figures are the average of two runs for each gas.

Under the existing experimental conditions, soil had little effect on methyl bromide, carbon monoxide, and carbon disulfide. The final concentration of each of these gases was practically the same whether or not soil was used. The cause of the decrease in the amount of the relatively unreactive carbon monoxide and carbon disulfide in the absence of soil is not known.