

brane by a halo. The nuclei were hypertrophied to a maximum of twice their normal diameter. There was some accompanying cytoplasmic degeneration, mitotic division and regeneration of acini. The nuclear alterations persisted as long as a month after the last injection.

It is not claimed that any of the changes are identical with those caused by viruses though they resemble them in certain particulars. The experiments do show, however, that nuclear alterations something like those previously reported *in vitro* may be produced *in vivo* by relatively mild procedures which do not kill the animals. They also raise several questions for further study.

7140 C

Bronchodilator Activity of Tyramine and its N-Methyl Derivatives.*

GORDON A. ALLES.

From the Laboratories of George Piness, M.D., Los Angeles, and the Pharmacological Laboratory, University of California Medical School, San Francisco.

There are few reported quantitative comparisons of the relative pressor and bronchodilator effects of chemicals in the epinephrine series, and it is an open question whether certain structural changes in such compounds may result in a relative increase of bronchodilator activity without a corresponding increase in pressor activity.

Tyramine, an extensively studied compound of this type, is a comparatively good pressor agent, but Jackson¹ reports that it does not exert any bronchodilator activity. He found, however, that hordenine, the N-dimethyl derivative of tyramine, dilates the bronchi, although it exerts considerably less pressor activity. Thus, with these compounds there seems to be a differentiation between pressor and bronchodilator effects which is compatible with the evidence of Cannon and Rosenblueth² that the chemical mediators involved in the transmission of sympathetic stimulation to the bronchi and the blood vessels are not the same.

In the present work, a comparative study of the pressor and bronchodilator activities of the following compounds was made upon a series of 6 dogs and 4 cats, following technique already described.³

* Supported in part by the Christine Breon Fund for Medical Research.

¹ Jackson, D. E., *J. Pharm. and Exp. Therap.*, 1913, **5**, 479.

² Cannon, W. B., and Rosenblueth, A., *Am. J. Physiol.*, 1933, **104**, 557.

³ Alles, G. A., and Prinzmetal, M., *J. Pharm. and Exp. Ther.*, 1933, **48**, 161.

1. β -4-Hydroxyphenylethyl amine (Tyramine).
2. β -4-Hydroxyphenylethyl methylamine (Methyl tyramine).
3. β -4-Hydroxyphenylethyl dimethylamine (Hordenine).
4. β -4-Hydroxyphenylethyl trimethyl ammonium iodide (Hordenine methiodide).

It was noted that, contrary to the finding of Jackson and others, tyramine actively dilates constricted bronchi in suitable preparations. Methyl tyramine is equally effective both as a pressor and bronchodilator and in some cases appears to be somewhat the more active. These effects were observed with doses as low as 0.001 millimols per kilogram, injected intravenously. Equimolecular dosage of hordenine is regularly without action on blood pressure or the bronchi but 5 to 10 times this dose usually gives responses comparable to those of tyramine. Since hordenine exerts an effect similar to that of nicotine, it probably acts through a different mechanism than tyramine which has no nicotine-like action. Likewise with hordenine methiodide, nicotine-like pressor and bronchodilator effects are readily observed and this compound is about 50 times more active than hordenine itself in both its pressor and bronchodilator activities. When hordenine and hordenine methiodide are injected into unpithed animals in equally effective doses with regard to pressor effects they produce equivalent stimulation of the respiration, thereby indicating also a close similarity in their nicotine-like stimulation of the central nervous system.

From the present work there seems to be no differentiation of relative pressor and bronchodilator activities in the series of compounds here studied, although a differentiation of the mechanism by which they produce these actions is indicated by a comparison of tyramine or its methyl derivative with hordenine or its methiodide.

7141 P

Comparison of Osteogenic Power of Periosteal Transplants from Rib and Tibia.

H. C. FANG AND LEO J. MILTNER.

From the Department of Surgery, Peiping Union Medical College.

The object of this study was to compare the osteogenic power of periosteal transplants of the rib with those of the tibia.

Six healthy adult dogs were employed. All operations were car-