tered, 2) reversibly blocked and 3) irreversibly blocked. The differences in structure of pressor phenylalkylamines comprising the 3 groups are reviewed along with reference to other compounds which affect pressor action of these amines in a similar manner.

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Effect of Oxygen Tension on Sodium Transport Across Isolated Frog Skin. (25073)

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The transport of the sodium ion across the frog skin is an example of active transport (Huf, Wills and Cooley(1); Ussing and Zerahn(2)) and requires an adequate supply of oxygen. Production of the necessary energy depends on the integrity of oxidative enzymes in the skin. Cass(3) has shown that high oxygen tensions (8-35 atmos.) inhibit carbon dioxide production by frog muscle, and Gerschman *et al.*(4) have postulated that high oxygen tensions, like ionizing radiation, damage enzyme systems, possibly by increasing the concentration of free radicles in the tissue. The present study was undertaken to see whether a high pressure of oxygen inhibits sodium transport in the frog skin as it does other vital processes.

Method. The preparation used was essentially that described by Huf *et al.*(1). The skin was stripped from the hind legs of a frog and tied off at the distal ends to make 2 bags. Each bag was suspended "inside out" from the end of a piece of glass tubing inserted in the neck of the bag. Well-aerated Ringer's solution was introduced into the skin bag and the bag was completely immersed in similar Ringer's solution. The levels of the 2 solutions were the same inside and out to avoid hydrostatic effects. The preparation from one leg of each frog was placed in a simulated bomb kept at room pressure and temperature ($19 \pm 1°C$) for 24 hours as a control and the skin bag from the other leg was placed for an equal period in the same room in a bomb where the pressure was elevated to 8-12 atmospheres using either 100% oxygen or 2.5% oxygen in nitrogen. Gas was introduced slowly over a 20 minute period to minimize rise in temperature due to compression. All gas that entered the bomb was passed through a carbon dioxide absorber to avoid depression of sodium transport by high carbon dioxide tension(2). The volume and sodium content of the Ringer's solution in the bag was measured at beginning and end of experiment. The area of the skin was measured by placing it on squared paper and counting the squares. Sodium analysis was carried out by flame photometry. The transport of sodium out of the bag was calculated as microequivalents per square centimeter per hour. (μ eq/cm^2/hr.).

Results. The transport in each experimental preparation was calculated as a per-

TABLE I. Statistical Analysis and Summary of Results.

Condition	Control	x	s	n	x *vs* 100%		x *vs* N_2 8-10 atm.	
					t	p	t	p
1. O_2 8 atm.	.143 ± .086	65.4	10.6	11	10.9	.001	13.7	<.001
2. O_2 8, 10, 12 "	.153 ± .076	57.4	10.9	15	15.1	.001	10.9	"
3. N_2 8, 10 "	.134 ± .050	111.5	17.8	7	1.7	0.15		

The means, x, are in % of 1 atm. air control taken as 100%.

centage of that in its paired control. The means (x) of these values (Table I) and their standard deviations (s) were found when (1) oxygen pressure equals 8 atmospheres, (2) oxygen pressure equals 8, 10, and 12 atmospheres, and (3) nitrogen pressure equals 8 or 10 atmospheres. The means (x) were first compared to 100% (the air control); then the high oxygen experimental means were compared to the nitrogen experimental mean in terms of t-value (t) and probability (p). Number of experiments in each series is denoted by (n). In all cases the formula(5)

$$t = \frac{x_1 - x_2}{Sp\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

was used where Sp is the standard deviation of the pool.

There was a great variation in absolute value of the transport of sodium in different experiments. The average control with standard deviation is expressed in Table I in microequivalents of sodium per centimeter square per hour (μ eq/cm^2/hr.).

In conditions 1 and 2, mean transport in the high oxygen tension is significantly lower than the control values (1 atm. air) but in condition 3, the high nitrogen pressure without deprivation of oxygen had no significant effect. Furthermore, comparison of the effects of high oxygen tension and of high nitrogen tensions showed that mean transport was significantly lower in the former case.

Therefore, we may conclude that oxygen tensions in excess of 8 atmospheres markedly inhibit sodium transport in the frog skin and that high pressures of nitrogen with normal oxygen tensions (*i.e.*, high pressures *per se*) do not have this inhibitory effect. These observations are consistent with the idea that excess of O_2 interferes with the normal activity of oxidative enzymes and inhibits sodium transport by diminishing the supply of energy available for the purpose.

Summary. Oxygen at 8 to 12 atmospheres depresses the transport of sodium ion across the isolated frog skin to 57.4%. Addition of 8 to 10 atmospheres of nitrogen without oxygen deprivation had no such effect.

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Rapid Production and Detection of Insulin-Binding Antibodies in Rabbits and Guinea Pigs. (25074)

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Insulin has generally been regarded as weakly antigenic in man and animals(1,2,3). Yet it has been demonstrated that virtually all humans receiving insulin therapy for more than a few weeks develop circulating insulin-binding antibodies demonstrable by technics employing I^{131}-labeled insulin and paper elec-

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