TABLE V. Statistical Appraisal of Protection by Pantothenic Acid (PA), Pantoyltaurine (PT) or Taurine (T) against Toxic Effects of P^{32}.

Dietary supplement	No. of mice	Survivors at 21st day Chi²	P*	Avg length of survival R†	P*
PA‡	339	61.4	$<.001$	7.1	$<.001$
PA§	316	5.5	$<.02$	2.9	$<.01$
PA‖	79	4.6	$<.05$	3.0	$<.01$
PT	259	19.1	$<.001$	5.9	$<.001$
T	197	1.4	$>.05$	2.4	$<.02$

* Probability for a chance occurrence.
† Ratio of difference between adjusted means to its stand. error.
‡ PABA included in vit. mixture.
§ " excluded from vit. " .
‖ " included in vit. " . Sulfasuxidine not added to diet.

injury. It seems unlikely that a deficiency of PA, pyridoxine, B_{12}, or folic acid will develop in humans under ordinary conditions, in view of the wide occurrence of these vitamins in natural foods, as well as of their extensive synthesis by the bacterial flora, perhaps by the tissues also. It is possible, however, that, in the radiation syndrome, diminished food intake, impaired absorption from the intestine, severe damage to other tissues, and, in addition, administration of large amounts of antibiotics might lead to an actual deficiency. In such a condition there would be a definite indication for the administration of generous amounts of those vitamins which, in our experiments, appeared to exert a beneficial action.

Summary. A significant protection against the injurious effects of P^{32} was observed by the administration of pantothenic acid to mice on a deficient diet. Pantoyltaurine was almost as effective in this respect as the natural vitamin. ω-methyl pantothenate was totally ineffective.

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Performance of Acclimatized Mice at Altitude. (21040)

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One of the most impressive experiences that one has who journeys to high altitudes and remains there for awhile is the increasing subjective sensation of well being from that of initial feeling of distress. Each day physical work becomes a little easier and mental attitudes become a little less confused. It is well established even in the transient sojourner at natural high altitudes that acclimatization is an important factor in his ability to perform well(1). There are, however, some questions which are not completely answered. How much does acclimatization at a lower altitude increase performance at a

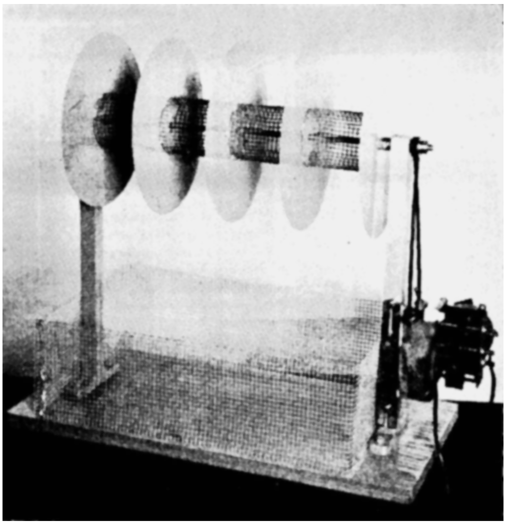

FIG. 1. Photograph of treadmill used for performance tests. Each compartment was 6 inches in width.

higher altitude? How important is the increase in erythrocytes and hemoglobin produced at one altitude to the performance of the organism at a higher altitude? Does the organism lose the advantages gained slowly or rapidly? To test ideas along these lines an experiment was carried out on a group of white mice which were acclimatized in a low pressure chamber.

Procedure. Fifty white mice from the Duke University colony of the New York State Hygiene Dept. strain were divided into 2 groups. One group was kept as ground level or as unacclimatized controls and the other group was slowly acclimatized to a simulated altitude of 20,000 feet (350 mm Hg). All mice were fed the same type of food, given adequate water, and kept at the same environmental temperature. Acclimatization was accomplished in the following manner: The first day the test mice were kept in the low pressure chamber at a pressure of 550 mm Hg and the pressure was reduced by about 30 mm Hg each succeeding day until the pressure of 350 mm Hg was reached on the eighth day and the pressure kept constant at that point for the rest of the experiment. Each day the pressure was lowered to ground level, cages were cleaned and fresh food and water placed in the cages, and the animals weighed. This took approximately one hour. During this period the mice were taken into a large low pressure chamber to 28000 feet (247 mm Hg) and subjected to performance tests. During ascent and descent to the test altitude mice were kept in cages in which a gas mixture of air and oxygen prevented them from becoming hypoxic. The mice were subjected to ambient air during the tests and were in an hypoxic environment only during actual performance tests. Control and acclimatized mice were treated exactly the same. The performance tests were made as follows: One mouse was placed onto one compartment of a motor driven treadmill and kept there until it fell off. This treadmill, which is shown in Fig. 1, had 4 compartments. The treadmill was driven at a constant speed of 12 R.P.M. The tracks on which the mice moved were constructed of hardware screen cloth, 3/16 inch mesh. Mice have an inherent fear of falling and will run or cling to this screen until exhausted. When they were exhausted they fell onto a platform below the mill and were then placed in a jar containing oxygen where they were resuscitated. The exact time of performance on the treadmill was determined by stopwatch by the observer. To eliminate any training error the control mice were tested each time the acclimatized mice were tested. All groups were exercised on the treadmill at ground

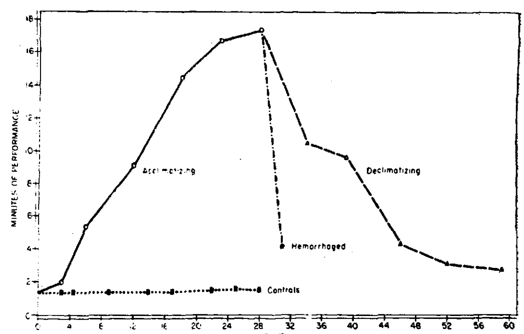

FIG. 2. Graphical representation of results of altitude performance tests on experimental mice subjected to a pressure of 247 mm Hg. At the end of the thirtieth day acclimatization was discontinued and 12 of the acclimatized mice were bled and the remainder (13) were returned to ground level. Test continued as indicated. Points plotted are average values for each group.

TABLE I. Total Hemoglobin Concentration in Blood of Ground Level Control and Altitude Acclimatized Mice.

	g Hb/100 ml blood
Control mice	13.8 ± 1.7 (S.D.)
Acclimatized mice	
1st bleeding	21.1 ± 2.3 (S.D.)
2nd bleeding	11.1 ± 3.4 (S.D.)

level for 10 minutes each day to further reduce a difference in training. There were no significant differences in weights of controls and acclimatized animals during the experiment. When tests had proceeded for 28 days, one group of the acclimatized mice were bled from a tail blood vessel and the hemoglobin concentration determined by a met-cyan hemoglobin method(2) using an Evelyn photoelectric colorimeter. The controls were likewise bled and hemoglobin determinations made. The remainder of the mice which had been acclimatized were then returned to ground level. Performance tests were continued on both controls and the previously acclimatized group over a period of 2 weeks. The mice which had been bled were also tested again over a 4-day period and then re-bled.

Results. The results of these tests are shown in Fig. 2 and Table I. It will be seen that the acclimatized mice showed a rapid increase in performance when subjected to an ambient pressure of 247 mm Hg as compared with unacclimatized mice. Every mouse showed an increase in performance but some more than others. The control group showed no significant change in performance indicating that training was not a factor in these tests.

These results also show that the reverse of acclimatization proceeds rapidly. They also show that removal of blood lowers the level of performance. Perhaps the more interesting aspect is that the mice which were bled did not return to the same level of performance as the unacclimatized controls, but showed a higher level of performance. Analyses showed that their hemoglobin concentration after bleeding was lower than the controls even though their performance was much better. This would seem to indicate that that hemoglobin increase during acclimatization is not the sole factor in accounting for increase in performance at altitude.

Summary. Mice acclimatized to one altitude (350 mm Hg) showed an increase in performance when exposed to a higher altitude (247 mm Hg) as compared with ground level controls. When acclimatized mice are bled they showed a decrease in their performance level. This decrease in performance is not in proportion to the blood withdrawn indicating that an increase in hemoglobin concentration is probably not the sole criterion for an increase in performance at altitude.

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