of it being extractable by cold water. It is not at present clear whether perhaps this portion was excreted through the skin and only adhered to the hair, the other half having been deposited in the hair keratin. Whatever the exact mechanism, it seems fairly certain that the eradication of dermatophytic infections by griseofulvin is due to its incorporation somehow in keratinous tissues.

J. C. GENTLES

Department of Bacteriology,
The University, Glasgow, W.2.

M. J. BARNES
K. H. FANTES

Glaxo Laboratories Ltd.,
Sefton Park, Stoke Poges, Bucks.

[1] Gentles, J. C., *Nature*, **182**, 476 (1958).
[2] Brian, P. W., *Ann. Bot.* (N.S.), **13**, 59 (1949).

Effects of Deficiency of Pantothenic Acid on Oxygen Poisoning in the Rat

IT has been known for many years[1] that a close connexion exists between pantothenic acid and the suprarenal glands, atrophy of which may result from a deficiency of pantothenic acid. More recently, Hurley and Morgan[2], arguing that animals in the final stages of pantothenic acid deficiency should behave as though adrenalectomized, showed that rats on such a diet were less resistant to the stress of anoxia than were normal controls.

It has, however, been shown that when the 'stress' is exposure to pure oxygen under high pressure, adrenalectomized rats fare better than do normal animals[3–5]. I found[6] that the variability in the time of appearance of nervous system effects in oxygen poisoning was very great in adrenalectomized rats and could not be correlated with the presence of small amounts of residual cortical tissue. Since it seemed reasonable to assume that a dietary deficiency would affect all susceptible tissue, irrespective of its site in the body, it followed that a pantothenic acid deficiency might well dispose of aberrant cortical tissue in a way that operation could never do. If such deficient animals were at least as resistant as operated animals and showed less variability of response, the result would tend to confirm the hypothesis that in operated animals the variability was in fact due to aberrant cortical tissue.

A series of experiments was carried out to test the effects of exposure to pure oxygen under a pressure of 6 atm. on rats reared on a pantothenic acid-deficient diet. Eight litters of eight rats, four of each sex, were used. The basic diet was that already described by me[7]. Appropriate vitamin supplements other than pantothenic acid were added to it, and it was fed to the mothers from 12 days before weaning. On weaning, the young rats were divided into 4 groups as follows: *A*, rats fed the deficient diet *ad lib.*; *B*, rats given the basic diet with vitamin supplements, including pantothenic acid (that is, the control diet), and pair-fed within litters with those of *A*; *C*, rats from which both adrenals were removed four days before exposure to oxygen and fed the control diet *ad lib.*; *D*, rats fed the control diet *ad lib.*

At the age of approximately 8 weeks the rats were exposed to oxygen under 6 atm. in a way already described[6]. Four male and two female rats in group *A* died before exposure to oxygen.

The mean times to the onset of severe poisoning, with standard errors, were, for the four groups, as follows: *A*, 49·75 ± 4·46 min.; *B*, 37·50 ± 1·94 min.; *C*, 45·12 ± 2·78 min.; *D*, 30·50 ± 1·09 min. Both the deficient and the operated rats (*A* and *C*) were more resistant than groups *B* and *D*, although, of these, the pair-fed rats *B* were more resistant than the controls fed *ad lib.* (*D*). There was no significant difference in resistance between groups *A* and *C*. Groups *A* and *C* were more variable than group *B*, itself more variable than the controls fed *ad lib.* (*D*).

The effects of pantothenic acid deficiency on oxygen poisoning thus resemble those of adrenalectomy. The problem of the variability of response in these animals remains unsolved. That the diet was effective was shown by the six deaths, by greying of the fur and by the relative failure of the rats to grow; but there was no evidence that time to onset of severe poisoning was related to body-weight. There was no relationship between weight of suprarenal tissue and time to onset of severe poisoning in group *A*, but three of the four most resistant animals had glands which were obviously hæmorrhagic. It is not clear how to determine precisely, in terms of cortical function, the response of individual rats to the pantothenic acid-deficient diet, and thus one source of variability may have been substituted for another. Or it may be that the variability is due to a highly complex relationship between suprarenal cortical function and response to exposure to oxygen under high pressure.

I am indebted to Mr. R. M. Cormack of the Department of Statistics, University of Aberdeen, for help in the design and analysis of the experiments.

D. W. TAYLOR

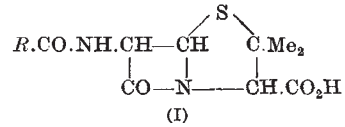
Department of Physiology,
Marischal College, Aberdeen. Nov. 10.

[1] Morgan, A. F., and Simms, H. D., *Science*, **89**, 505 (1939).
[2] Hurley, L. S., and Morgan, A. F., *J. Biol. Chem.*, **195**, 583 (1952).
[3] Bean, J. W., Johnson, P., and Smith, C. W., Abstr. Nineteenth Int. Physiol. Congr., 945 (1953).
[4] Gerschman, R., and Nadig, P. W., *Fed. Proc.*, **12**, 159 (1953).
[5] Taylor, D. W., Abstr. Nineteenth Int. Physiol. Congr., 821 (1953).
[6] Taylor, D. W., *J. Physiol.*, **140**, 23 (1958).
[7] Taylor, D. W., *J. Physiol.*, **140**, 37 (1958).

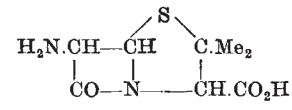
Synthesis of Penicillin : 6-Aminopenicillanic Acid in Penicillin Fermentations

THE work reported here stemmed from the experiments described in an earlier communication[1] on *p*-aminobenzylpenicillin, in which discrepancies were observed between chemical and biological methods of penicillin assay when a precursor was omitted from penicillin fermentations.

The various penicillins (formula I) may all be regarded as acyl derivatives of a common parent amine, 6-amino-penicillanic acid (formula II: for nomenclature see Sheehan *et al.*[2]). We wish to report the isolation of pure 6-amino-penicillanic acid from penicillin fermentations carried out in the absence of added side-chain precursor, the culture used being an isolate from *Penicillium chrysogenum W*.51.20.



(I)



(II)