hexabenzoyl derivative of a base of this composition. It may be inferred from these results that streptothricin contains 3 or 4 hydroxyl groups in addition to 2 acylatable basic groups.

Hydrolysis of streptothricin with hydrochloric acid has yielded two water-soluble bases in form of their crystalline picrates, on which we shall report in a separate communication.

STREPTOMYCIN REINECKATE

This compound was obtained from submerged culture filtrates[9] by a procedure similar in many respects to that employed in the isolation of streptothricin. It crystallizes from water in thin plates which decompose at 162–164° (corr.). Two preparations derived from different fermentation batches were analyzed after drying at 70° *in vacuo* (H_2O–loss: 6.1 per cent., 5.8 per cent.): C, 27.1, 26.9; H, 4.65, 4.31; N, 21.4, 20.8; S, 20.8, 21.2; Cr, 8.53, 8.27. The inconsistencies in some of the analytical figures preclude the assignment of a definite empirical formula at the present time. However, formulae $(C_{14}H_{26}O_7N_9S_4Cr)_n$ or $(C_{14}H_{26}O_8N_9S_4Cr)_n$, corresponding to $(C_{10}H_{19}O_{7-8}N_3)_n$[11] for the basic component, are in reasonable agreement with the above data and provide a basis for calculating the potency of free streptomycin. Since the two analyzed preparations of the crystalline reineckate assayed 370 and 410 units (10) per mg, respectively, it follows that the potency of the pure streptomycin base should lie between 800 and 910 units per mg. Decomposition of one of these preparations with silver sulfate yielded streptomycin sulfate assaying 850 units per mg.

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CHRONIC INTERMITTENT ANOXIA AND IMPAIRMENT OF PERIPHERAL VISION[1]

IN general, the methods which have been employed in testing visual functions under conditions of acute anoxia have failed to reveal reliable signs of impairment below altitude pressures of 12,000 feet above sea level.[2] Comparable studies for possible effects of chronic intermittent anoxia have been lacking. With the great expansion of aviation in the present war, it became imperative to establish a sound basis for Service regulations governing the use of oxygen equipment on repeated missions. Twenty male subjects, selected to meet the age, physical and mental standards of the Service Air Corps, were exposed in a low pressure chamber to a simulated altitude of 10,000 feet above sea level for five or six hours per day, six days per week, for a period of four to six weeks. Before, during and after the period at altitude, peripheral vision was systematically studied in each subject by means of a newly developed, quantitative campimeter.[3]

During the third or fourth week of exposure at 10,000 feet, thirteen of the twenty subjects developed a marked and progressive impairment of peripheral vision. This impairment was reflected by failure to see targets briefly exposed in the peripheral field that had previously been readily detected. It occurred in some subjects without any associated alteration of central vision, although in others both functions were impaired. It developed insidiously in the sense that the subjects were unaware of it. Once established, it could not be relieved immediately by the inhalation of 100 per cent. oxygen at altitude and it could still be detected on the same day at ground level, although to a less marked extent. The effect was not immediately reversible in some subjects at the end of the four- or six-week period; in some instances days or weeks elapsed before return to preexposed levels of visual efficiency. One subject, who developed a very marked impairment of peripheral vision with delayed recovery, was reexposed nine months later. During the second exposure, however, he breathed 100 per cent. oxygen during the middle hour of each daily five-hour period at altitude. Under these conditions no impairment of peripheral vision occurred.

Four additional subjects were likewise chronically exposed to a particular altitude ranging from 11,500 to 18,000 feet. In these individuals the impairment of peripheral vision appeared earlier, was more marked and was recovered more slowly as the altitude, or the degree of anoxia, was increased. These subjects were studied by Bryan and Ricketts[4] in their search for possible effects upon the adrenal cortex of chronic intermittent anoxia. They were maintained

[1] The work described in this paper was done under a contract, recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the University of Chicago.

[2] H. G. Armstrong, "Principles and Practice of Aviation Medicine," second ed. Chapter xviii. Baltimore: Williams and Wilkins Co. 1943.

[3] W. C. Halstead, *Arch. Neurol. and Psychiat.*, 52: 252, 1944.

[4] A. H. Bryan and H. T. Ricketts, *Jour. Clin. Endocrinol.*, 4: 450, 1944.

on constant, weighed diets, and careful metabolic technique was followed throughout. Studies were made of glucose tolerance, urinary excretion of sodium, potassium, chloride, phosphorus, nitrogen and 17-ketosteroids. With the possible exceptions of a slight increase in potassium excretions in two subjects, a transient rise in 17-ketosteroid excretions in one subject and moderate decrease in tolerance for glucose in two, the findings pointing towards changes in the adrenal cortex were negative. Since all these subjects developed an impairment of peripheral vision at altitude, there would seem to be no relationship suggested between the alteration in peripheral vision and any of the variables studied by Bryan and Ricketts.

Certain lines of evidence point to the cortex of the frontal lobes of the brain as the probable region involved in the alteration of peripheral vision described here. A similar impairment has been found to result from removal of one or both prefrontal lobes in neurosurgical patients studied in this laboratory, while the effect has not been found following unilateral removal of any other lobe of the brain.[5] The effect has also been found here to occur on a transitory basis following partial destruction of both frontal lobes in man by the operation known as lobotomy. In this connection it is of interest that Kennard[6] and others have found a temporary alteration of peripheral vision to be produced by localized lesions in the frontal lobe of the Macaque monkey.

In the present investigation, 65 per cent. of the subjects exposed to chronic intermittent anoxia of altitude pressures as low as 10,000 feet above sea level developed a marked impairment of peripheral vision. It seems clear that former Service regulations which specified the use of oxygen above this altitude did not provide an adequate margin of safety.

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INHIBITION OF GROWTH OF MYCOBACTERIUM TUBERCULOSIS BY A MOLD PRODUCT[1]

A NUMBER of reports have been made on the effect of various antibiotic agents derived from molds and higher bacteria upon the growth of *M. tuberculosis in vitro* and in some instances on the inhibition of experimental animal tuberculosis.[2,3,4,5,6,7] The present investigation is concerned with the *in vitro* inhibition of the tubercle bacillus by another product obtained from an as yet incompletely identified mold, one of a group of Aspergillaceae under study at the present time. The mold was grown on a modified Czapek-Dox medium for 14 days, the medium filtered clear of mold and debris, acidified to pH 1–2 and extracted with ether. The active material was separated from the ether by 0.5 N NaOH. Concentration was accomplished by repeated ether-alkali extractions using decreasing quantities. The final alkali extract, representing a concentration of the production medium of from 50 : 1 to 300 : 1, was neutralized with 4 N HCl. A highly colored product was obtained. This was found to be soluble in water or alkali and insoluble in acid. The acid precipitate was readily soluble in ether, chloroform or ethyl acetate.

The rapidly growing non-pathogenic strain of *M. tuberculosis* var. *hominis* (American Type Culture Collection No. 607) was used to test the antibiotic activity of the preparation. A standard inoculum, when floated on the surface of Long's or Dorset's synthetic liquid medium and incubated at 37.5° C, shows rapid growth so that within 5 days a dense, crinkled pellicle covers the surface of the medium and extends up the sides of the test-tube for a height of about 0.5 cm. A series of test-tubes, 1 inch in diameter containing 5 ml of liquid medium, to which varying concentrations of extract were added, was inoculated with a standard fragment of pellicle obtained from a freshly growing culture. The tubes were incubated at 37.5° C for from 5 to 14 days and the variation in growth recorded daily. It was found that the inoculum failed to show any evidence of proliferation when the concentration ranged from 0.03 to 0.09 ml of extract per ml of liquid medium, depending upon the potency of the extract. Partial inhibition of growth, which was characterized by varying degrees of proliferation of the inoculum, was obtained in a range of 0.01 to 0.04 ml extract per ml liquid medium. Culture of the partially or completely inhibited inoculum which was still floating at the end of the test period, however, showed active growth when transplanted on solid media. In another series, inocula were submerged in liquid medium to which a quantity of extract had been added that was known to be sufficient to produce complete inhibition of growth of a floating inoculum. Controls consisted of submerged inocula in liquid medium to which no

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