REFRACTIVE ERRORS OF THE HUMAN EYE

A COMPARATIVELY short Medical Research Council Report* on "Emmetropia and its Aberrations" contains a wealth of stimulating ideas and original data on the causes and incidence of refractive errors in the human adult eye. It will engage the attention of ophthalmologists, refractionists, physiologists and human geneticists. While a knowledge of elementary biological statistics is required to understand the full implications of the results, the authors have taken great care to state their conclusions clearly in plain language and also graphically.

The report opens with an excellent, comprehensive and critical review of previous studies in this field. The main part of the report deals with the careful investigation of 341 eyes by the measurement of the main refractive components—axial length, corneal power, depth of anterior chamber and lens power (the refractive indices of the refractive media are assumed to be the same for all eyes). Prof. Sorsby and his team have classified their material into two categories, emmetropia ($-0{\cdot}5$ to $+0{\cdot}5D$) and the lower degrees of ametropia on one hand, and the high ametropias (greater than $\pm 4D$) on the other.

In the emmetropic eye they find that the individual refractive elements show a wide range of values, but that a high degree of correlation exists between some of the components. They conclude that the high incidence of emmetropia in the population is due to a high degree of co-ordination in the development and growth of the eye. A similar range of values is found in the lower ametropias, but here co-ordination of the components is imperfect.

In contrast the high ametropias differ from both emmetropia and the lower ametropias in having an abnormality in one component, usually the axial length, for which no amount of adjustment in the other components can compensate. It is concluded that these high refractive errors can no longer be regarded as the result of the intensification of the condition found in low ametropia, but must be regarded as 'pathological'. Further research on this point is clearly indicated.

Several stimulating hypotheses are put forward to account for the high degree of co-ordinated growth found in approximately 95 per cent of human eyes, and a brief account is given of some preliminary experiments on the growth of the rabbit eye designed to test these hypotheses. It has long been believed that there is a hereditary influence on the determination of the refractive state. Some frustratingly brief and interesting preliminary information is given on the genetic aspect of emmetropia and its aberrations.

All interested in this subject will look forward keenly to the results of this team's future research on the growth of the eye in children and animals and to the elucidation of the genetic implications. In this work may lie the final answer to the fascinating problem of co-ordinated growth not only in the eye, where physical size is all-important, but also in the general body structure. F. W. CAMPBELL

* Medical Research Council Special Report Series, No. 293: Emmetropia and Its Aberrations—a Study in the Correlation of the Optical Components of the Eye. By Arnold Sorsby, B. Benjamin, J. B. Davey, M. Sheridan, and J. M. Tanner. Pp. viii+69. (London: H.M. Stationery Office, 1957.) 7s. 6d. net.

PERSISTENCE OF PATHOGENIC STRAINS OF *FUSARIUM* IN BANANA SOILS

IN a further study of the behaviour of *F. oxysporum* f. *cubense* in different soils, R. H. Stover (*Canad. J. Bot.*, **34**, 927; 1956) has shown that this organism, the cause of wilt or Panama disease of bananas, tends to diminish in artificially infested soils. Thus, after six to eight months, an initially large population of *Fusarium* obtained by inoculation had fallen to less than 500 spores per gram of soil but could be detected after two years in or around infested glass-cloth strips buried in banana plantations. The apparent differences between population counts in loam and sandy loam are attributed to some defect of the soil dilution plate technique which was used.

The soil plate technique consisted in adding 1 gm. of artificially infested soil to a culture dish, moistening the soil with a suitable nutrient, and observing growth and sporulation microscopically or by estimating colony increases on soil dilution plates. An external source of nutrient was essential for germination and sporulation. Among the nitrogen sources tested, 1 per cent solutions of tryptophan and glutamic acid stimulated the abundant production of spores, whereas inorganic sources of nitrogen were ineffective. Sporulation was greater in soils dried before plating than in soils maintained at 15–35 per cent saturation. Sporulation was greater in acid sandy loam than in alkaline loam and was abundant below *p*H 7·0 in all soils. Sporulation in soil plates was sparse or absent below *p*H 3·5 in acidified loam or above *p*H 8·8 in sandy loam. The optimum *p*H for sporulation in acidified loam was about 5·0 and in sandy loam 5·0–7·0. In general, the rate of disease spread in soils when they are first planted was correlated with soil texture, *p*H and amount of growth and sporulation on soil plates and buried slides. Thus, the soil, rather than the host, appears to be exerting the primary influence on the fungus. It was observed that *Fusarium* grew and sporulated abundantly in decomposing diseased banana pseudostems, on the surface of cut-open rhizomes and in adhering soil, but did not sporulate freely in sap or in the xylem *in vivo*. Fresh banana sap stimulated the abundant production of spores in soil plates. The evidence presented suggests that *F. oxysporum* f. *cubense* also sporulates in Nature in saprophytic association with certain soil–plant components.

STRATOSPHERIC DUST OVER BRITAIN

IT has been known since the eruption of Krakatoa in 1883 that volcanic dust can spread around the world. In July 1953, dust from an eruption in Alaska was seen over western Europe. The latest occurrence of this kind took place at the beginning of April 1956, and is especially interesting for the route taken by the dust. Wing-Commander R. F. Martin, the chief test pilot of the Gloucester Aircraft Company, and his navigator, Mr. P. W. Varley, flying at 50,000 ft. over Gloucestershire between 10.00 and 10.45 a.m. on April 3, saw a layer of 'cloud' off-white in colour and resembling an oily sea some 5,000 ft. higher up. The same evening, Mr. B. Ramsey, of the Meteorological Office, Aldergrove,

Northern Ireland, observed a very high 'cloud' layer at sunset. Flying next morning, Wing-Commander Martin passed through a cloud layer at a height of 40,000 ft. The tropopause was at about 35,000 ft., so this 'cloud' was well in the stratosphere.

The observations agreed closely with those of July 1953, and, in the absence of news of volcanic eruptions, the facts were given to the United States Weather Bureau with an inquiry as to whether there had been an eruption in Alaska. The Chief of the Bureau replied that an eruption of the volcano Bezymannaya Sopka (55° 57′ N., 160° 37′ E.) in Kamchatka on March 30, 1956, had been reported by Moscow radio. Further details of the report, which stated that dust was shot up to a great height, were thereupon obtained from the B.B.C. The Forecast Research Division of the Meteorological Office then examined from upper wind information the problem of whether the very high 'cloud' layer over western Britain on April 3 and 4 could possibly have been the dust of the Kamchatka eruption. Tracking back on the upper air charts at the 100 mb. pressure level (about 50,000 ft.), it was found that the air over Aldergrove on the evening of April 3 was over North Greenland at 9 a.m. on April 2. No information was available from Kamchatka or the Arctic basin at the 100 mb. level, but at the 200 mb. level (about 38,000 ft.) on March 30 the wind over Kamchatka was southerly, 60–70 m.p.h. Supposing that the wind over the Arctic basin at 100 mb. was not very different from this, air at that level over Kamchatka on March 30 would have crossed the North Pole and reached a point a little north of Greenland by the afternoon of April 1. It thus seems very probable that the stratospheric 'cloud' layer was in fact dust from the eruption in Kamchatka which had reached Britain in three days across the North Pole along a track of some 5,000 miles in length.

Details of the eruption and of the determination of the trajectory are given by G. A. Bull and D. G, James in the issue of the *Meteorological Magazine* of October 1956.

ANTIVIRAL ACTIVITY OF GLYOXALS

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RECENT reports of observed antiviral activity of compounds with an α,β-dicarbonyl structure[1,2] lead us to submit some results of experiments with compounds of this type and of very closely related ones.

In screening compounds for growth-inhibiting activity towards influenza *A-USA*-47 (*A′* strain former designation FM_1) a number of α-keto-aldehydes appeared to be active. The experiments were carried out with eleven-day-old embryonated hen's eggs. In each experiment six eggs were used. One hour prior to inoculation of the eggs in the allantoic fluid with 0·1 ml. 10^{-4} dilution of a standard seed virus (*ID*50 about 7), 0·2 ml. of a 0·1 *M* solution or suspension of the compound to be tested was injected into the allantoic cavity. The compounds were dissolved or, when necessary, suspended in saline. After incubating for 48 hr. at 36° C. the hæmagglutination titre of a pool of allantoic fluids from treated eggs was determined. Dead embryos were discarded. A compound was considered active if the difference between the logarithm of the hæmagglutination titre of allantoic fluids from eggs injected with virus and 0·2 ml. saline and the logarithm of the titre of allantoic fluids from treated eggs surpassed + 0·6.

From Table 1 it can be seen that not all glyoxals are active. Compounds with closely related structural features appear to be non-inhibitory in this test. It must be realized that negative results with compounds tested in suspension might have been caused by an insufficient solubility of the compound in the allantoic fluid.

The compounds 3, 4, 17, 20, 21 from Table 1 appeared to be inactive when tested in the following way. A subtoxic dose was injected into the yolk sac of six-day-old chick embryos. After four hours the eggs were also infected in the yolk sac with the virus. Further incubating at 36° C. showed no difference between the mortality of treated and of control eggs (injected with virus and saline).

Investigation *in vitro* of some active compounds (according to Table 1) revealed a direct action on the virus. The virus particles lose their infective power when incubated with glyoxals at low con-

Table 1

No.	Compound	Difference between the log hæm-agglutination titres	
1	CH_3—CO—CHO	2·0	*b*
2	*n*-C_4H_9—CO—CHO	0·2	*c*
3	φ—CO—CHO	0·2*a*	*c*
4	*p*-OH—φ—CO—CHO	2·0	*b*
5	*p*-OH.*m*-NO_2—φ—CO—CHO	2·3	*c*
6	*p*-Br—φ—CO—CHO	0·7	*c*
7	*m*-NO_2—φ—CO—CHO	2·1	*c*
8	*m*-NH_2—φ—CO—CHO	0	*b*
9	α-Thienyl—CO—CHO	0·1	*c*
10	α-Naphthyl—CO—CHO	0	*c*
11	*p*-OH—φ—CO—C(NOH)—H	0·1	*b*
12	CH_3—CO—CO—CH_3	0·4	*c*
13	*i*-C_3H_7—CO—CO—*i*-C_3H_7	0·0	*c*
14	*p*-OH—φ—CO—CO—φ—*p*-OH	0·1	*b*
15	*p*-OH*m*-NH_2—φ—CO—CO—φ—*p*-OH*m*-NH_2	0·1	*b*
16	CH_3—C(NOH)—C(NOH)—CH_3	0·4	*b*
17	*p*-OH—φ—CO—C(NOH)—CH_3	0·1	*b*
18	CH_3—CO—COOH	− 0·1	*b*
19	φ—CO—COOH	0·1	*b*
20	φ—CH_2—CO—COOH	0	*b*
21	φ—CH_2—C(NOH)—COOH	0·2	*b*
22	φ—CS—COOH	0	*b*
23	φ—C(NOH)—COOH	0·1	*b*
24	*p*-Br—φ—CH_2—C(NOH)—COOH	0·2	*b*
25	CH_3—CO—$CONH_2$	0·1	*c*
26	α-Thienyl—CO—$C(OC_2H_5)_2$	0·5	*c*
27	*n*-C_4H_9—CO—$C(OC_2H_5)_2$	0	*c*
28	*m*-NO_2—φ—CO—CH_2OH	0·3	*c*
29	*m*-NO_2—φ—CO—CH_2—CO—φ.*m*-NO_2	− 0·3	*c*
30	Cyclohexane 1,2-dioxime	0·5	*c*
31	2-Ketogulonic acid	0·2	*c*
32	Indanedione 1.3	− 0·1	*c*
33	Diphenylparabanic acid	− 0·4	*c*
34	Adrenochrome	0·2	*c*

a, In two experiments with a double dose of this compound, which appeared rather toxic, the differences in the logarithms of the hæmagglutination titre were 1·6 and 1·0.
b, Tested in solution.
c, Tested in suspension.