

DUST AND THE INCIDENCE OF SEVERE TRACHOMA*†

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A dry dusty climate has long been noted as a factor associated with a high incidence of trachoma and the complications of that disease (Duke-Elder, 1938).

Epidemiological studies, recently carried out in India by means of an exhaustive random sample survey by the Trachoma Pilot Project-India, show conclusively that the incidence of trachoma is highest in the dust-laden north and north-westerly areas of the sub-continent, while it is lowest in the south and east (Gupta and Preobragenski, 1964). An earlier survey based on figures obtained from eye hospitals and clinics all over India demonstrated an almost exactly similar distribution (Ursekar, 1955). The work of Gupta and Preobragenski also showed that new cases of trachoma in India reach their peak incidence during the dry pre-monsoon and post-monsoon periods (Cooper, 1964).

The present writer, working with figures from ophthalmic clinics in Ghana, noted a higher incidence of trachoma in the dry areas of the Northern Territories than in the coastal belt (Sarkies, 1952).

Present Investigations

An analysis of cases seen at a series of clinics in different parts of the Republic of South Africa during the past 3 years (Table) suggests a considerably higher incidence in the dry Transvaal than in the southern districts. Even more striking is the high incidence of entropion in the Transvaal, which probably gives a fairly reliable index of the severity of the disease.

TABLE
ANALYSIS OF CASES SEEN AT CLINICS IN VARIOUS AREAS IN SOUTH AFRICA

Area	Total Patients Seen	Trachoma (all grades)	Entropion
Lusikisiki, Transkei	245	39	3
Sekhukhuniland, Transvaal			
(a) Clinics	1,700	689	123
(b) School Surveys	660	590	—
Zeerust, W. Transvaal	1,679	966	179
Bochum, N. Transvaal	1,411	986	297
Sterkspruit, Ciskei	195	62	9

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In the course of 3½ years, 916 cases of trachoma were admitted to this hospital. Most of them were advanced cases with entropion which needed operative correction. Examination with the biomicroscope showed particles of dust, varying from minute discrete particles floating in the secretions of the conjunctival sac to accumulations of dust on the roughened surface of the tarsal conjunctiva and between the follicles. Much of the dust could be wiped away with a moist stick-swab, though some still remained embedded in the conjunctiva after this procedure.

When sections of the tarsal plates and overlying conjunctiva, which had been removed at operation from cases of entropion, were examined under polarized light, fine scintillating particles could usually be seen in the fibrotic conjunctiva and subconjunctival tissues. Identification of this dust in stained sections was made difficult by the presence of cells which tended to mask the particles. It was thought that unless the dust was such that it scattered polarized light, it might be missed altogether in such preparations. Accordingly, histological preparations were made of conjunctiva from the tarsal plates removed from 28 cases of entropion. These specimens, preserved in formol saline, were pinned out flat on a wooden block and the conjunctiva shaved off with a scalpel. The slips of conjunctiva were then dehydrated in the usual way through the alcohols, cleared in xylol and mounted unstained in Canada balsam. Examination under low-power magnification showed particles of dust, often in large quantities. The particles were situated at different depths, and varied in size from 0.2 to 1.0 μ . Some were visible with normal lighting only, while others showed up with both normal and polarized light (Figs 1 and 2, opposite).

Climatic Considerations

In the area from which this hospital draws cases certain climatic considerations should be noted. The average maximum and minimum temperatures in summer are 85° and 60°F., falling in winter to 65° and 36°F. Nearly all the precipitation occurs during the summer—October to March; the average annual rainfall for the past 5 years was approximately 25 in., but may vary appreciably between villages only a few miles apart. The pattern in the rainy season is one of heavy storms separated by dry intervals. From April to September the rainfall is minimal. Dust storms occasionally occur.

In the native villages the water supply comes mainly from streams and ponds, and water for washing may have to be carried considerable distances. The natural supply is now being gradually supplemented by the sinking of boreholes.

Comment

It has been possible to demonstrate the presence of dust in cases of entropion complicating trachoma, not only free in the conjunctival sac but also embedded in the fibrotic conjunctiva overlying the tarsal plate. By the use of polarized light it is possible to differentiate at least two types of dust. Some variation from area to area would be expected depending on the geological formation. In the cases under consideration it is thought probable that the particles visible with polarized light are silica. In addition, particles were observed in some specimens which resembled the carbon particles seen in preparations from lungs affected by anthracosis. In this area there is considerable exposure to smoke in the native huts, especially amongst the women. A more exact identification of these dusts would require further research of a complicated nature.

The association of various dusts, notably silica, with fibrosing diseases of the lung

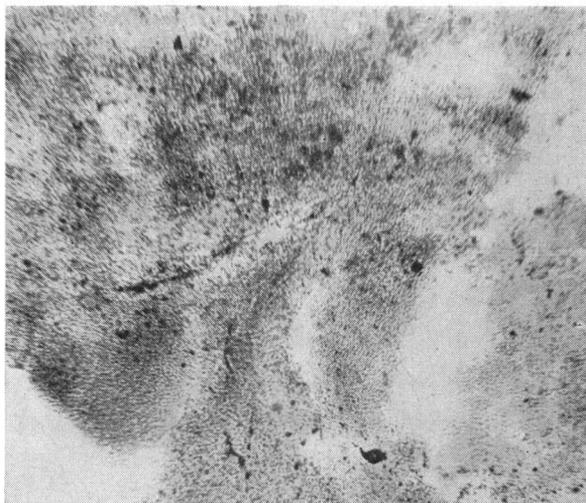


FIG. 1.—Mucous membrane from a severe case seen by ordinary light.

FIG. 2.—Mucous membrane from same patient seen by polarized light.



is well known, though the mechanism by which this comes about is still uncertain. There is, however, evidence to suggest that chronic infection is an important factor in the development of massive fibrosis in the pneumoconioses, tuberculosis being the usual infection in this group of diseases (Gough, 1959). The nature of the reaction between dust particles and living cells is not yet known, though research is proceeding on these lines (Policard, 1962).

The infective nature of trachoma is now well documented and the virus has been isolated from cases in many parts of the world. In this area a strain of the virus, isolated from a case of trachoma, has been successfully transmitted to a human volunteer (Scott, Gear, Cuthbertson, and Smith, 1960).

Dust particles have been found in the conjunctival tissues of the eyelid in an appreciable number of cases of trachoma in this region, which have progressed to the development of entropion. The significance of this observation is still regarded as conjectural. It remains to be seen whether dust is found in the conjunctival tissue from cases of entropion complicating trachoma in other areas.

Summary

Evidence is quoted to show an association between a dry, dusty climate and a high incidence of severe trachoma complicated by entropion. The clinical demonstration of dust particles in such cases is described, their penetration into deeper tissues being shown by histopathological methods.

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