THE REGIONAL ASPECTS OF RESPIRATORY ALLERGY IN SOUTH AFRICA*

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Respiratory allergy is a condition which manifests itself in the upper respiratory tract as seasonal hay fever, vasomotor rhinitis, nasal and paranasal allergy, and is characterized principally by nasal congestion, rhinorrhoea and sneezing. In the lower respiratory tract it occurs as asthma. The symptoms in hay fever or seasonal asthma are confined to certain months of the year and are due to the inhalation of the plant pollens present in the atmosphere during that time. In nasal allergy or allergic asthma of the perennial type symptoms are not limited to particular seasons and may be associated aetiologically with inhalants other than pollens, *viz.* animal dander, household or occupational dusts, feathers, etc.; with the ingestion of foodstuffs to which the patient is sensitive; or, wholly or in part, with emotional stress. 'Sinusitis' or paranasal allergy, both seasonal and non-seasonal, may be due to

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bacterial infection, but it is frequently based on allergic sensitivities with or without superimposed infection.

Respiratory allergy is common in many parts of South Africa. The incidence, seasonal occurrence, manifestations and even the severity of symptoms may vary in the different regions depending upon certain local factors which include principally climate, vegetation distribution and even sometimes race-group distribution.

The greater portion of South Africa has an elevation in the interior of over 3,000 feet bounded by the Great Escarpment (Fig. 1—thick black line), formed by mountain

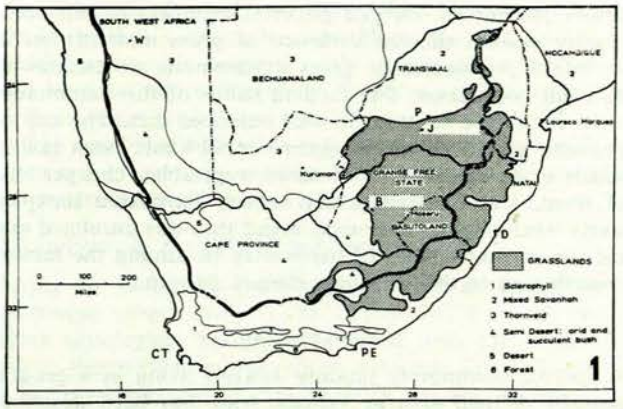

Fig. 1. Map of South Africa showing the approximate distribution of the principal vegetation types. The 'grasslands' are shown as stippled areas. The thick black line indicates the Great Escarpment. CT=Cape Town, PE=Port Elizabeth, D=Durban, W=Windhoek, B=Bloemfontein, P=Pretoria, and J=Johannesburg.

anges running from Namaqualand in the West to the Drakensberg in Natal on the East and falling away towards the coast in a series of terraces. The narrow strip long the coast has a height of 500 - 600 feet and, in parts, width of up to 30 miles. The low-lying parts of the ountry include portions of Natal, the lowveld of the astern Transvaal, the greater part of the Northern Transaal and a considerable portion of the North-Western ape.

CLIMATIC FACTORS

he Map in Fig. 2 indicates the climates in the different egions of South Africa according to the classification of öppen and Thornthwaite.[1] In general the climate of the ountry is temperate. It should be noted, however, that the astern and southern shores of the country are washed by ie warm Mocambique and Agulhas sea currents and are ius warmer than the western shores, where the influence f the cold Benguella current is apparent.

The highveld region of South Africa has a summer rainfall nd is the high plateau (4,000 - 6,000 feet) in the interior, overing a considerable portion of the Cape Province, Orange ree State and the Transvaal. The 'grasslands' of South Africa ig. 1) practically coincide with this Highveld region and will e referred to below.

It will be observed that a considerable portion of the western art of the country (1 and 2 in the map) consists of arid and esert regions. A predominantly winter rainfall is limited to ie extreme south-west corner of this subcontinent (3 in the iap) where Cape Town is the principal city. The relatively arrow strip on the east and south coasts (4 in the map) is a

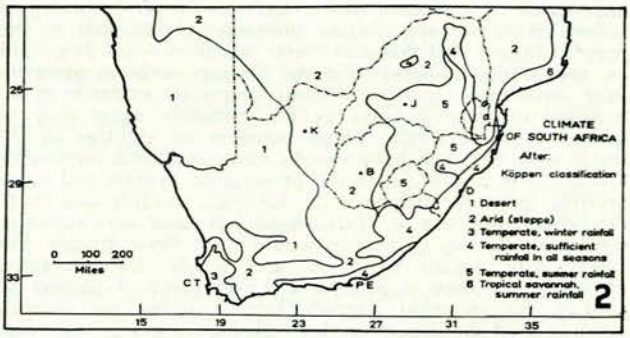

Fig. 2. Map showing the climate of South Africa. J=Johannesburg, B=Bloemfontein, D=Durban, K=Kimberley, PE=Port Elizabeth, CT=Cape Town.

temperate region with a year-round rainfall. Mists occur in the mountains of the Eastern Cape Province between the coast and the Great Escarpment and are most frequent in the winter. There is a 'mist belt' in Natal associated with southerly winds where the altitude is between 1,500 - 4,500 feet.

The effect of climate on respiratory allergy can be considered as being both *indirect* and *direct.*

1. *Indirect Effect of Climate on Respiratory Allergy*

Climate influences the regional types of vegetation and it is the latter, therefore, and not the climate *per se,* which are responsible for the various forms of seasonal respiratory allergy. This indirect effect of climate is discussed below under 'Vegetation types'.

2. *Direct Effect of Climate on Respiratory Allergy*

The direct effect of climate on respiratory allergy is still a controversial subject and there are many differing opinions and impressions, but so far no unequivocal association of climate and respiratory allergy, and particularly asthma, has been demonstrated.

Our own investigations[2-5] in South Africa and our studies based on this work from observation in and reports from other countries, have shown that there is a group of persons, whom we have termed the 'Climate group', whose symptoms are aggravated and often even initiated at the coastal areas, especially in warm countries. Symptoms of respiratory allergy are ameliorated or even considerably alleviated in these people when they move to or live in inland areas. This improvement, at first glance, appeared to be directly associated with the local climatic circumstances. At the coast the temperature and the relative humidity are generally higher; but of greater significance perhaps is the fact that these are both confined to a *narrow range* in the 24 hours of the day and during the year. This feature is in striking contrast to that of the inland regions where there is a *wide range* in both temperature and humidity in the corresponding periods. This difference is illustrated in Fig. 3 where Kimberley, an inland town, is compared with Durban on the East coast. Nevertheless the mechanisms of the effect of such climatic differences on respiratory allergy are not clear if a purely 'climate' agent is sought. We have shown that in the coastal areas the local 'house dust' has a greater allergenic potency than that from the inland regions. A partial explanation for this is that in the clear atmosphere the house dust of the inland high altitude regions is subjected to, and so modified by, the ultraviolet radiations. At the coast,

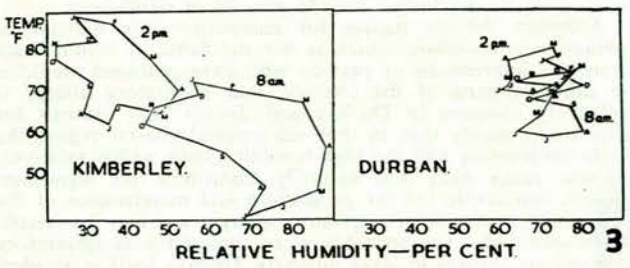

Fig. 3. Comparison of the climate patterns: *Inland* (Kimberley) and at the *Coast* (Durban), based on diurnal and monthly figures of temperature (°F) and relative humidity (%).

especially in the Port cities, the ultraviolet-light effect is reduced by the prevailing moisture in the atmosphere and by the smoke in the air emanating from harbours and industries. We have noted that a number of persons in this 'Climate group' have benefited by desensitization with extract of house dust obtained from the coast, when they were once more able to live at the coast in relative comfort. The suggestion is therefore that it is not climate itself but an intermediate agent—house dust in this instance—that is responsible for the influence of climate on this type of respiratory allergy. By 'climate' is meant the grosser climatic factors such as temperature, humidity, atmospheric pressure, etc. We have suggested 3 possibilities for consideration regarding the way in which climate might affect respiratory allergy:

1. Certain climatic circumstances, or changes of climate, act as *irritants* and, like any other irritant, are able to provoke symptoms in a basically allergic person.
2. The local 'house dust' is rendered more allergenic under certain conditions and a susceptible patient is affected, not by the climate directly, but by the more potent house dust at the coast.
3. The effect of climate on the allergic subject may not be due to any *gross* climate factors at all, but may be associated with the state of the ionization, both qualitatively and quantitatively, of the atmosphere in different regions. Sufficient information on this subject in South Africa is not yet available for comment to be made, or for conclusions to be drawn regarding the significance of atmospheric ionization.

VEGETATION DISTRIBUTION IN RELATION TO SEASONAL RESPIRATORY ALLERGY

The approximate vegetation distribution in South Africa is shown in Fig. 1. In the 'grasslands', shown as a stippled area on the map, there is a relatively massive growth of the long and the short grasses and there is consequently much grass pollen in the atmosphere during their flowering time in the summer.

Seasonal pollinosis hardly constitutes an aetiological problem in South Africa.[6] Almost all the seasonal, respiratory allergy patients in this country develop symptoms in the summer. This is the flowering time of the 'grasses', and consequently grass pollens are abundant in the atmosphere and are responsible for the symptoms. The sufferers are derived mainly from the 'grasslands' of the country (Fig. 1) and manifest symptoms in the period October to March.

In brief, therefore, the patient sensitive to summer grass pollen tends to find relief from his symptoms in the sclerophyll, thornveld, desert, and semi-desert areas, as well as in the coastal regions of the East, South and West, where there is relatively little grass. In the lowveld regions (2 in the map), the low-lying country in the extreme Eastern and Northern Transvaal, grasses also occur in quantity, but their flowering season extends well into the winter, i.e. beyond March into June and even into July. The forest regions (6 on the map) along the mountain ranges parallel to the South and Eastern coasts of the Cape Province have but a scanty grass cover.

In Fig. 4, the vegetation distribution of the Natal region is shown in greater detail. This map is based on the aero-ecological map by J. A. Pentz and information kindly provided by Prof. J. D. Scott. It will be observed that there is a narrow

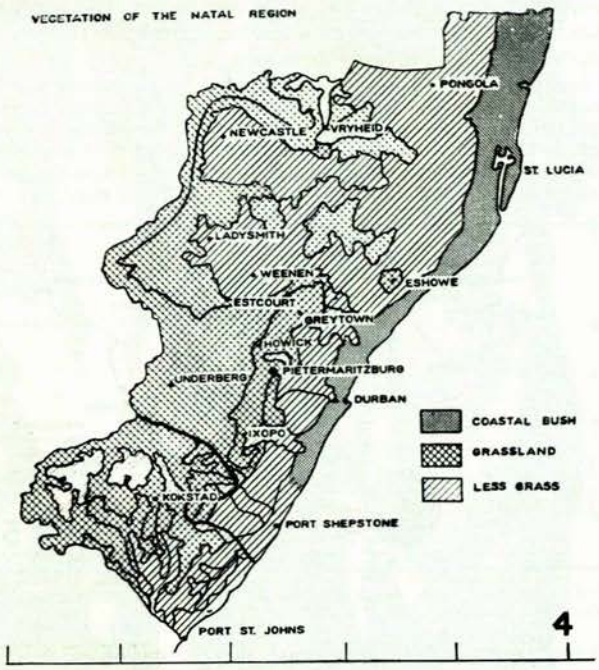

Fig. 4. Map of Natal showing the coastal bush and grass distribution.

coastal bush area up to 30 miles wide along the East coast—indicated on the map by stippling—where there is hardly any grass. This means, in effect, that grass-sensitive persons from the interior will find relief from symptoms in the summer when visiting the Natal coast. Virtually the whole of this coastal bush area has been cut into for the growing of sugar cane. Sugar cane is of course a 'grass' (*Graminae*), but in the growing of this plant for industrial purposes, the pollination stage is not reached and thus pollen from the sugar cane is not present in the atmosphere. In the more inland parts of Natal, forests have been replaced by grasslands, with scattered clumps of trees. Extensive areas of grassland are thus present in Natal, generally above an altitude of 3,000 feet and summer grass pollinosis is therefore to be expected.

Hay fever confined to spring (Aug. - Sept.) is frequently reported in many parts of the country. Certain exotic trees—Plane (*Platanus spp.*), Oak (*Quercus spp.*) and Poplar (*poplus spp.*), in particular pollinate in this season. Spring hay fever constitutes only a small proportion of seasonal hay fever cases. The Compositae plants blossom throughout the year in some parts of the country, but principally in the spring in the Karoo districts of the Cape Province, and also further north in the Namaqualand region. The pollen is mainly insect-borne and thus not likely to be responsible for respiratory allergy. In parts of these arid and semi-desert regions the veld composites occur in profusion in the spring, but the population there, mostly a farming community, is rather small and Compositae pollinosis is thus hardly significant. Some of the weeds of this group—Cosmos (*Cosmos bipinnata*) and the Khaki weed (*Tagetes minuta*)—flower in the late summer (March - April), and may be associated with a few cases at that time of the year. With the extension of building activities into the rural areas, these weeds are being eradicated and their effects

ecome less significant. The Prosopis (*Prosopis spp.*) is fairly ommon in parts of South West Africa and gives rise to ymptoms of seasonal pollinosis mainly in October and lovember. These trees are rather scant in South Africa, but o occur in isolated places.

RACIAL DISTRIBUTION

Generally speaking it has been observed that the incidence f respiratory allergy is considerably lower in the Bantu eoples than it is in the European population. The approxiate racial distribution in some of the bigger centres of outh Africa is indicated in Fig. 5.

The Coloured or Eurafrican population constitutes a conderable proportion of the community in the Cape Province specially in Cape Town and Kimberley as shown in the map, nd in them the incidence of respiratory allergy is virtually the ame as in the Europeans. In the Asiatics—the Indian popula-on—who form a large proportion of the community in

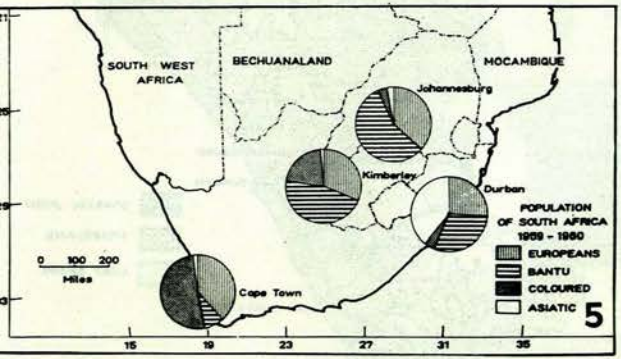

Fig. 5. Map of South Africa showing the race distribution in some of the bigger centres.

urban and district, respiratory allergy, including asthma, ppears to be more common than in the Europeans. The reason r this is under investigation, but it seems that the greater notional instability in this group is probably a factor in the tusation of perennial allergy, vasomotor rhinitis and asthma. udies are being made to determine whether specific food-stuffs used by the Indian peoples may be of significance.

Although definite figures for comparison are difficult to obtain in a condition which is not notifiable, it would seem from the impressions of persons who have practised medicine in different parts of the country, that respiratory allergy is relatively common in Durban and district. The reasons for this are probably that in that sub-tropical coastal region the high temperature and the high humidity, both within relatively narrow range daily and annually, contribute the significant factors favourable for the production and maintenance of the 'Climate group' type of respiratory allergy; and that the Asiatic population, who are probably more susceptible to respiratory allergy, are present in large numbers. Durban itself is an ideal natural laboratory and clinic for the study of respiratory allergy, and we have frequently visited Durban and Pietermaritzburg, some miles inland, for purposes of investigating the condition. The 4 racial groups—Europeans, Eurafricans, Indians and Africans—live almost side by side, and the comparison of the incidence, aetiological factors, manifestations and effects of respiratory allergy can be made without undue difficulty.

SUMMARY

The relative incidence of respiratory allergy in the different parts of South Africa is discussed with the aid of maps, in relation to geographic, climatic and vegetation distribution features as well as in relation to the racial distribution of the population.

Thanks are due to Miss E. J. Walker for drawing the maps in Figs. 1, 2, 4 and 5 and to Mr. M. Ulrich of the Photographic Unit of this Institute for the photographs.

Various details regarding climate and vegetation have been obtained from the *Official Year Book of the Union of South Africa*[7] and the data of race distribution from the *Year Book and Guide to Southern Africa*.[8]

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