The Prevalence of Hepatitis B (Australia) Antigen in Southern Africa

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SUMMARY

The prevalence of hepatitis B (Australia) antigen (HBAg) in 38 941 apparently healthy persons of various ethnic groups living in the Transvaal was determined by counter-current immuno-electrophoresis or by complement fixation. The prevalence was 0,09 - 0,6% in healthy Whites, 0,9% in Coloured donors, 2,0% in urban Negroes and 7% in rural male Blacks. The positivity rate in 444 healthy Black subjects and in 423 Sana (Bushmen) inhabiting areas in the northern and north-western regions of Southern Africa ranged from 2,7 to 15,8%.

An assessment of the frequency of HBAg in various tribal groups of either Sana (Bushmen) or rural Blacks indicated that geographical environment might be one of the factors influencing antigenaemia in healthy persons. The prevalence was highest in persons originating from the west coast regions of Southern Africa, in adjoining territories proceeding from the central plateau, and those countries north of this area (9,1 - 13,6%). An intermediate prevalence of 6 - 7% was noted in some regions abutting on the east coast strip, and a lower prevalence was recorded for inland regions, including Lesotho, the eastern Orange Free State, Natal Midlands and Zululand (4 - 4,7%), while the lowest frequency was found in northern Natal and the central Transvaal areas (2 - 3%). A small group of Sana in the north-eastern corner of South West Africa who had an incidence of 2,7% was the only one which did not fit in with the general geographical distribution of HBAg observed.

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The prevalence of hepatitis B (Australia) antigen (HBAg) in apparently normal populations shows a marked geographical variation. It is greatest (20%) in parts of South East Asia and in certain tropical countries and least (0,1%) in temperate countries of Western Europe and North America.[1,2] The varying frequency of the HBAg carrier state can probably be attributed to many factors, including the socio-economic conditions in which the people live, the age and sex distribution[3] and genetic make-up[4] of the population, the risk of exposure to blood-sucking vectors,[5] the likelihood of visiting witch-doctors or taking part in ritual tribal ceremonies in which skin is scarified with unsterile instruments,[6] and the prevalence of main-line drug addiction.[7]

The presence of HBAg in apparently healthy individuals has practical importance in so far as these people serve as a reservoir for the spread of the antigen and virus B (serum) hepatitis.[8-10] Particularly significant in this regard are blood donors. The occurrence of HBAg in blood donors has ranged from 0,1% in voluntary blood transfusion services to 2,0% when the donor is paid for his blood.[11] The need for appropriate screening tests to prevent the use of this blood is apparent. Meyers *et al.*[12] have documented the prevalence of the HBAg carrier state in the population groups living in the Cape Province.

The purpose of this study was to determine the figures for the different ethnic groups residing in the Transvaal, and for Blacks originating in various parts of southern and south-western Africa.

POPULATIONS STUDIED

Healthy Whites: blood was obtained from 1 206 volunteer blood donors, and from 1 050 apparently healthy male mine workers, all living in the Transvaal.

Healthy Coloured paid blood donors: this group was composed of 2 095 persons, mainly females, living in apparently permanent residence in various urban areas of the central Transvaal.

Healthy Blacks: included in this group were (*i*) 15 560 paid urban donors, who were mainly females, and who had probably been resident within the central Transvaal area for many years; (*ii*) 19 030 paid rural Black donors. These persons were adult males recruited from several countries within Southern Africa for work in the mines. Their period of residence in the Transvaal varied from 9 months to 2 years; (*iii*) 444 individuals from 5 tribal groups inhabiting regions in north-western South Africa.

METHODS

Sera were tested for the presence of HBAg by counter-current immuno-electrophoresis (CIEP)[13] or by the complement fixation technique (CF).[14] The antibody used was initially obtained from baboon serum (prepared and provided by the Natal Blood Transfusion Service). Latterly, a human antibody (obtained from Spectra Biologicals, USA) was used for the CIEP method, and a rabbit antibody (Behringwerke) for the CF method. Reference antibody-containing sera used for control of accuracy of each test procedure were obtained by the courtesy of Professor Sheila Sherlock (London) and Dr A. M. Prince (New York). In addition, a panel of antigen-containing sera of known concentrations was obtained from Electro Nucleonics (Bethesda, Maryland, USA).

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TABLE I. HBAg IN HEALTHY PERSONS FROM VARIOUS POPULATION GROUPS

Group	Sex	Number tested	Number positive	Percentage positive
White blood donors	Males and females	1 206	1	0,09
White miners	Males	1 050	7	0,6
Coloured blood donors	Mainly females	2 095	19	0,9
Urban Black donors	Mainly females	15 560	311	2,0
Rural Black donors (mine workers)	Males	19 030	1332	7,0

TABLE II. HBAg IN VARIOUS HEALTHY BLACK TRIBAL GROUPS (34 590 CASES)

	Rural Blacks		Urban Blacks	
Region	No. tested	% positive	No. tested	% positive
Northern Natal	197	2,0	97	5,1
Central Tvl	64	3,0	702	2,2
Lesotho and E. OFS	1 346	4,0	3 011	1,7
Natal Midlands	419	4,7	74	8,2
Zululand	933	4,7	3 256	2,2
Pondoland	663	5,4	87	3,4
Mozambique and E. Tvl	3 271	6,0	724	2,9
Malawi	2 214	6,4	None urbanised	
Transkei	3 260	6,7	2 478	2,0
Swaziland	791	6,8	1 303	2,2
Northern Tvl	383	7,0	1 455	1,8
Botswana	4 972	9,1	2 362	1,8
Zambia	240	10,0	11	10,0
Angola	277	13,6	None urbanised	

RESULTS

Table I shows the prevalence of HBAg in healthy persons from the various ethnic groups living in the Transvaal. Because of the high prevalence of HBAg in healthy Blacks, it seemed necessary to investigate the distribution of the carrier state in various tribal groups represented in the urban and rural populations. The findings are summarised in Table II. The prevalence of HBAg in urban Black subjects, who were mainly females, was lower than in the rural groups, except in northern Natal, where the reverse was true, and the central Transvaal and Natal Midland regions, where there was no significant difference. Parallel results were not available for persons from Malawi and Angola, since very few of these people live in urban areas of the central Transvaal.

The prevalence of hepatitis B antigenaemia in 5 tribal groups from north-western South Africa is shown in Table III.

Sana (Bushmen) inhabiting regions adjoining the above geographical areas showed a similar high incidence of HBAg except for a small group, the *G! an G! ai*, living in the north-eastern corner of South West Africa. Table IV shows the results obtained in these Sana population groups.

The apparent geographical distribution of HBAg in the various Black and Sana tribal groups is more clearly illustrated in the map (Fig. 1). The map shows that the prevalence of the antigen is greatest in the areas extending towards the north-west coast of Southern Africa from part of the central plateau, and areas almost north of the latter region. The east coast area, including a portion of Malawi, Mozambique, Swaziland and the Transkei, has the next highest frequency. Abutting on this strip are areas of slightly lower prevalence (the Natal Midlands,

TABLE III. PREVALENCE AND TRIBAL DISTRIBUTION OF HBAg IN GROUPS FROM NORTH-WESTERN SOUTH AFRICA

Tribe	Number tested	Number positive	Percentage positive
Kwangali	82	13	15,8
Geiriku	107	15	14,0
Shambyu	98	14	14,0
Mbunja	49	4	8,2
Mbukushi	108	8	7,7
Total	444	54	12,0

TABLE IV. HBAg IN SANA (BUSHMEN) FROM VARIOUS REGIONS OF SOUTHERN AFRICA

Region	Number tested	Percentage positive
Botswana border and central areas	328	10,3
Caprivi Strip	59	10,0
North-east SWA	36	2,7

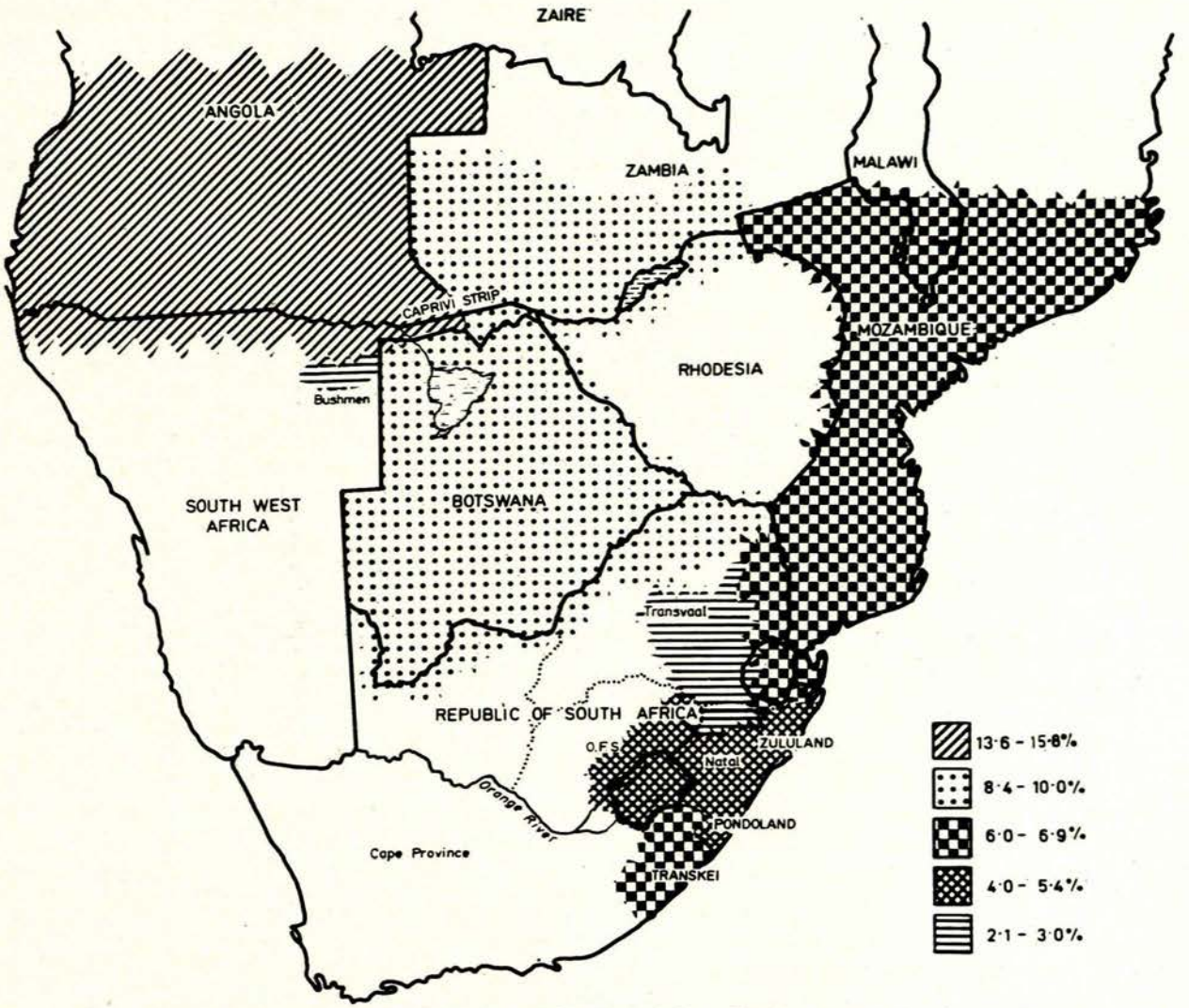

Fig. 1. The prevalence of HBAg in rural Southern African Blacks. The relative frequencies are shown by hatched areas of varying densities. Those regions for which no information is available are not shaded.

Lesotho, the eastern Orange Free State, Zululand and Pondoland), while the lowest frequency is found in northern Natal and the central Transvaal. Some Botswana tribes and Sana (Bushmen) fit into the picture fairly well, both groups showing a prevalence of HBAg similar to that of other tribes originating from the western side of Southern Africa. However, a small group of Sana in the north-eastern area of South West Africa do not fit into this category, but instead tend to resemble the rural Black inhabitants of the central Transvaal and the Northern Natal in their prevalence rates for HBAg. The map is of course only an approximation of the true picture. Confirmation of our findings would be possible only if the blood of persons living permanently in the actual areas delineated was studied.

DISCUSSION

Our investigations indicate that healthy Whites living in the Transvaal have a prevalence of hepatitis B antigenaemia comparable with that observed in similar persons in other countries of western Europe and North America.[15-19] Coloured persons residing in the Transvaal appear to have only a slightly greater frequency (0,9%). This latter group was represented mainly by adult females and this may have influenced the relatively low prevalence, since similar persons living in the western Cape have been shown to have a prevalence of 2,22%.[32] Unfortunately the sex distribution in the latter study was not stated.

The high prevalence of HBAg in apparently healthy Blacks and in persons of Sana origin is not a unique characteristic of these particular ethnic groups. Similar high frequencies have been recorded in healthy populations in other parts of the world, e.g. Greeks,[20] Indians living in Peru,[21] Chinese,[22] Japanese,[23] and northern Australian Aborigines.[24] As Szmuness *et al.*[3] pointed out, this varied distribution of high prevalences of HBAg does not seem to implicate the carrier state as a genetically inherited characteristic. There must therefore be some other explanation for the frequent occurrence of HBAg in some populations.[5]

Our studies revealed that antigenaemia was approximately three times as common in rural Black subjects as in urban persons of similar tribal origin. The reason for this striking difference is not apparent from our observations. However, certain factors which may have contributed to the differing frequencies may be considered. Differences in sex distribution may be implicated, since the urban group were mainly females whereas the rural donors were males. However, the finding that urban females originating from northern Natal had a frequency rate of HBAg approximately twice as high as their rural male counterparts, and that no differences were demonstrable in other areas, indicates that other factors are also important. Among these is the duration of residence in the temperate climate of the central Transvaal. The urban Blacks have probably lived permanently or semi-permanently in the local areas and some may have been residents there for many years, possibly all their lives. These people return to the countries or areas of their origin on brief visits, perhaps once annually or less frequently. As urbanised persons they tend to adopt some White habits and customs. On the other hand, the rural group studied consisted of men originating from various countries within Southern Africa. They are recruited under contract for mine work for a relatively short period of about 1 - 2 years, after which it is customary for them to return to their homelands. At a later stage they may again work on the mines for a similar short period of time and therefore, in general, they may be regarded as temporary residents of the Transvaal.

When our results were analysed according to the countries or areas of origin it became apparent that geographical and climatic factors may be important in determining the prevalence of the HBAg carrier state. Hepatitis B antigenaemia was most frequent in west coast regions, the central plateau and some northern areas, intermediate in subtropical east coast countries and much lower in some more southerly inland regions.

Other factors to be considered are the tribal customs and habits of groups of people of various origins which may be responsible, at least in part, for the differential prevalences. It is well known that, during some stage in their lives, many Blacks scarify themselves, according to the particular customs of their tribes, either for superstitious reasons or because they believe that this will protect them from a variety of illnesses. Ear-piercing and tattooing, partly for decorative purposes, are also commonly practised, and marks depicting initiation of persons reaching the age of puberty are frequently seen on the faces or other parts of the body of various tribal groups. A marked variation in extent of scarification procedures exists in various tribes.[25] Moreover, many of these people are in the habit of visiting a witch-doctor when feeling ill, and he frequently scarifies the skin as part of his treatment. Instruments used for these practices are not sterilised and these practices may provide a mode of transmission of HBAg from one person to the other.

The Sana also indulges in scarification practices. Further, since they inhabit the very arid regions of the Kalahari, water is too precious a commodity to permit them to bathe themselves except very rarely, if at all.[26] Lack of hygiene may also contribute to the carrier state of HBAg.

Confirmation of these assumptions would be possible only if extensive investigations were carried out *in situ* on persons living in the various geographical regions of this country. Within each area many different tribes dwell and each individual one may practise different customs which may give rise to a variety of HBAg prevalence rates. In our study it has been shown that in a relatively small sample drawn from five tribal groups inhabiting a small region of the northern section of SWA and regions adjoining it, considerable variation (7,7-15,8%) was observed. A similar variation in antigenaemia may exist in other regions where multiple tribal groups live, differing in customs and habits, which may influence their respective carrier rates of the antigen. We did not, in our study, have the opportunity of investigating biochemical and other immunological abnormalities which may have been present in the apparently healthy persons investigated. Nor do we know how many of the samples tested were from persons who had evidence of liver disease. These are all factors which would provide a more complete answer to the question of the HBAg carrier state in these population groups.

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