

Studies on the Dd Antigen-Antibody System

IV. Antibodies to the Dd Antigen in Selected Populations From Asia, Africa and Europe

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ABSTRACT The present paper records the Dd-reactor frequencies reported earlier among various populations from Asia and presents such original data on the Nigerian from Africa and the Hungarian and Greek from Europe. Furthermore, the possible explanations for the observed variation in the frequency distribution (range 0-35%) have been discussed.

INTRODUCTION

Saline extracts of certain specimens of human dandruff yield an antigen against which circulating antibodies are found in some, but not all individuals. The antigen is called Dd (the name derived from dandruff) and was first reported by Shrivastava (1972). Individuals with antibodies to the Dd-antigen in their serum are called Dd-reactors, while those lacking it are called Dd-non-reactors. Reactivity to the Dd antigen is apparently confined to humans, since it has not been detected in such common animals as rhesus monkey, sheep, goat, rabbit, mouse, guinea pig and the domestic fowl (Kaur et al., 1978, 1979).

The nature of the Dd antigen is not yet known precisely (Kaur and Shrivastava, 1982) and the possibility that it may be a microbial antigen against which antibodies are formed as an immune response is not ruled out (Kaur and Shrivastava, 1983a). Studies conducted to see whether the antibody response to the Dd antigen is genetically transmitted have been inconclusive so far.

Several populations have been screened for the presence of antibodies to the Dd antigen.

Shrivastava (1972) reported a frequency of 3.97% Dd-reactors in blood donors from Poland. In India, Kaur and Shrivastava (1974) found 24.17% Dd-reactors in caste-undifferentiated sample from Punjab in North India, while in two other but similar samples from the same region, the frequencies noted were 19.81% and 25.0% (Kaur and Shrivastava, 1983b). Further studies made on various populations from Punjab have reported a Dd-reactor frequency of 19.28% for a mixed sample (Kaur et al., 1977) and 17.31%, 21.90% and 19.44% for the three major groups of the Jat Sikh, the Khatri and Balmiki, respectively (Kaur et al., 1981). In the cold and dry Ladakh district of the northernmost Indian state of Jammu and Kashmir, Dd-reactor frequencies of 4.88% and 11.86% have been recorded in the two major religious communities of Muslims and Buddhists in that order (Kaur and Shrivastava, 1983b). Interestingly no Dd-reactors were found either in the Rana Tharu tribals from the submountain areas of the State of Uttar Pradesh (Kaur and Shrivastava, 1983b) or the Gaddi tribals inhabiting the hills of the State of Himachal Pradesh (Kaur et al., 1980).

The occurrence of antibodies to the Dd-antigen has been recorded in a variety of diseases. The Dd-reactor frequencies not differing significantly from that in the controls (25.0%) were found in such conditions as rheumatoid arthritis, breast cancer and nephrotic syndrome, whereas they were significantly lower in cardiovascular diseases, gastrointestinal tract diseases, cirrhosis and neurological diseases (Kaur and Shrivastava, 1983c).

Here we report the occurrence of antibodies to the Dd-antigen in the Greek, Hungarian and Nigerian populations.

MATERIAL AND METHODS

The Greek and Hungarian serum samples (100 each) were obtained and brought to India by one of us (HW). The Nigerian blood samples were obtained from 51 students studying in Universities at Patiala and Chandigarh in India. Except when in transit, all samples were stored at -20°C .

Sera were screened for the presence of antibodies to the Dd-antigen by the technique of immuno-electroosmophoresis (IEOP) in agarose gel buffered in barbitone at pH 8.2. The Dd-antigen used was derived from pooled antigen-containing specimens of dandruff and was prepared as described earlier (Shrivastava, 1972).

RESULTS AND DISCUSSION

Table 1 gives the Dd-reactor frequencies observed in this study along with those observed earlier by some of us in other populations. We shall not consider here results of the study made in Poland since the technique used in it was that of double diffusion in agar and not IEOP (Shrivastava, 1972).

The wide range of variation in Dd-reactor frequencies, from zero to 35%, is striking but at the same time difficult to interpret. Of the populations that have been studied for the Dd-antigen-antibody system to date, the Nigerians

are Negroid, the Ladakhis are principally Mongoloid and the rest are all Caucasoid. The frequencies observed in different population sample from Punjab compare well with those in the Greek, Hungarian and Nigerian populations and therefore, for the purpose of this discussion, we may place them all in one group. The other group, characterised by significantly lower Dd-reactor frequencies would then include the Rana Tharu, Gaddi tribals, and the pooled sample from Ladakh. The great magnitude of difference between these two groups, as revealed by chi-square test ($P < 0.001$), needs to be explained in terms perhaps other than ethnic variation.

We have referred to a suggestion made in an earlier study (Kaur and Shrivastava, 1983c) that the Dd antigen may be of microbial origin. For a working hypothesis this suggestion would seem quite plausible. It is not unusual for microbes to have a non-random geographical distribution under the influence of various local environmental/ecological factors. It is conceivable, therefore, that our putative microbe may be absent or marginally present in areas inhabited by populations belonging to what we have called the low Dd-reactors frequency group. In fact, what the members of this group share in common is their association with the Himalayan mountains—the Rana Tharu live in its foothills and the Gaddi at a mean altitude of about 2,000 m and above.

The microbial basis of the Dd antigen also finds support from some of our recent and as yet unpublished observations. Our studies of the Dd antigen-antibody system in the populations from Punjab have shown that individuals can be classified into different categories depending on their status with regard to the Dd-antigen and the antibody to it. First, there are about 40% individuals who have neither the Dd antigen in their dandruff nor antibody to it in their serum. The second type is represented by a little less than 30% individuals who do not have the Dd antigen in their dandruff, but have antibody to it in their serum. The third

Table 1 : Distribution of antigen Dd reactors in selected populations of Asia, Africa and Europe

Population	Number tested	Dd-reactors (%)	Reference
ASIA			
Punjab I	120	24.17	Kaur & Shrivastava, 1974
Punjab II	223	19.28	Kaur et al., 1977
Punjab III	318	19.81	Kaur & Shrivastava, 1983b
Punjab (blood donors)	300	25.00	Kaur & Shrivastava, 1983b
Jat Sikh	156	17.30	Kaur et al., 1981
Khatri	105	21.90	Kaur et al., 1981
Balmiki	108	19.44	Kaur et al., 1981
Ladakh (Muslim)	82	4.88	Kaur & Shrivastava, 1983b
Ladakh (Buddhist)	59	11.86	Kaur & Shrivastava, 1983b
Rana Tharu	120	0.00	Kaur & Shrivastava, 1983b
Gaddi	80	0.00	Kaur et al., 1980
AFRICA			
Nigerian	51	31.37	Present study
EUROPE			
Greek	100	35.00	Present study
Hungarian	100	23.00	Present study
Polish (blood donors)	126	3.97	Shrivastava, 1972

type includes some 20% individuals who have Dd antigen in their dandruff but lack antibody to it in their serum. In the fourth type are included individuals (10%) who have both Dd antigen in their dandruff, and the antibody to it in their serum.

Let us consider these categories one by one. The first type, where both antigen and antibody are absent, can be easily accounted for - the antibodies are not there because there is no antigenic challenge. Similarly, the fourth type can also be explained by reversing this logic. The situations posed by the remaining two types are somewhat difficult to interpret. To explain these situations, factors such as the dose and duration of antigenic stimulus and immunosuppression could surely be brought into consideration, but in our opinion an equally plausible and far more simpler explanation would be that the Dd antigen may have other habitats besides dandruff. This would readily explain why presence of the antigen in dandruff is not critical to the formation of the corresponding antibody in an individual (*i.e.* type three) or why the antibodies are formed in

spite of the antigen being absent from dandruff (*i.e.* type two).

Our attempt to solve the enigma surrounding the Dd antigen- antibody system is still in the realm of conjecture. This, however, should not detract the usefulness of this system as a tool in anthropological research, since it has been our experience that once present in an individual both the Dd antigen and the antibody to it become his stable characteristics.

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