Isohemagglutinins and Immunity in Malnutrition

By E. KAHN, M.D., M.R.C.P.E., D.C.H.,* H. STEIN, M.B., M.R.C.P.E., D.C.H.,* AND A. ZOUTENDYK, M.R.C.S., L.R.C.P.†

LITTLE is known about resistance to infection in cases of human malnutrition, but some, though not all, experiments on malnourished animals[1] have shown that there is a poor immune response to antigens.

A large number of malnourished children, mostly cases of typical kwashiorkor, are seen in our wards, and it is our impression that they have a poor resistance to infections. We planned to test this suspected low state of immunity objectively, but for a variety of reasons we have been unable to study the antibody response resulting from such antigenic stimuli, as diphtheria or tetanus toxoids, typhoid vaccine or similar antigens. The chief difficulty of this method lies in the follow up of a population group with a high mortality and with a marked inclination to frequent changes of abode.

In considering alternative methods of assessing the efficiency of the immune mechanism, the estimation of total gamma globulin appeared to offer little hope of providing an answer to our question. Although it was at one time claimed that gamma globulin is reduced in human malnutrition,[2] there is now abundant evidence from this center[3] and elsewhere[4] that gamma globulin levels in these cases are usually normal or raised. Therefore, if the gamma globulin level of the serum were an indication of immune body production, the latter should be of the same magnitude as, or even greater, than in well-nourished individuals.

On the other hand, it seemed likely that any severe impairment of antibody formation would be reflected in a reduction of that specific group of antibodies known as isohemagglutinins. This hypothesis is supported by the fact that in congenital agammaglobulinemia, where immune body production is impaired, there is also usually a lack of isohemagglutinins.[5]

We, therefore, decided to investigate the isohemagglutinin titers in a series of severe cases of malnutrition (kwashiorkor) and compare them with those of normal controls, postulating that an impairment of immune production would be reflected in a reduction of isohemagglutinin titers.

MATERIAL AND METHODS

The investigations were carried out on 14 African children suffering from severe malnutrition (kwashiorkor) and on 11 normal controls. All malnourished children were suffering from nutritional edema. Other signs characteristic of malnutrition in African children[6] such as depigmentation of the skin, depigmentation and atrophy of the scalp hair, mucosal lesions and nutritional dermatoses were found in varying combinations in different cases. The ages of the patients and the normal controls ranged between eight months and three years.

The specimens of blood were obtained by venipuncture and the ABO group of each was ascertained on cells and serum; high titered Anti-A, Anti-B and Anti-AB grouping sera were used. All groupings and titrations were performed in tubes; the results were read macroscopically and the end points confirmed microscopically after one hour's contact at laboratory temperature.

RESULTS

The isohemagglutinin titers are shown in Table I. It will be noted that the titers of the

* Baragwanath Hospital, Johannesburg.

† Blood Group Research and Transfusion Laboratories, South African Institute for Medical Research, Johannesburg, South Africa.

TABLE I

Isohemagglutinin Titers in Malnourished Children and Normal Controls

Case Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Malnourished children	Blood group	A	B	B	O	A	O	A	O	AB	A	B	A	O	O
	Anti-A titer	—	16*	64	2	—	64	—	32	—	—	8	—	8	32
	Anti-B titer	16	—	—	4	4	128	128	32	—	16	—	4	8	32

Case Number		15	16	17	18	19	20	21	22	23	24	25
Normal controls	Blood group	O	O	A	B	O	B	A	A	O	B	AB
	Anti-A titer	16	16	—	1	512	16	—	—	16	16	—
	Anti-B titer	32	8	32	—	512	—	8	8	32	—	—

* 16 means a titer of 1:16, etc.

malnourished group did not differ significantly from those of the controls, with the exception of one control subject, who showed titers much above average. We know from our past experience with children of similar age that the results of both groups are within the normal limits found at this laboratory.

DISCUSSION

These results indicate that there is no significant reduction of isohemagglutinin titers in severely malnourished children. This is in agreement with the work of others who have shown that in man malnutrition or undernutrition is not associated with marked impairment of immune-body production.[1,7] It is, therefore, likely that the poor resistance to infection shown by severely malnourished children may be due to causes other than impaired antibody production.

SUMMARY

Malnourished children appear to have a poor resistance to infection. In order to determine whether this is due to impaired antibody production, the isohemagglutinin titers of 14 severely malnourished children were examined. These titers were within normal limits. This seems to confirm findings of other authors that in man, unlike laboratory animals, malnutrition does not impair immune-body production.

ACKNOWLEDGMENT

We wish to thank Miss Jean Mulroy for technical assistance.

REFERENCES

1. Gell, P. G. H.: Studies of Undernutrition, Wuppertal 1946–9. *Med. Res. Coun. Spec. Rep. Ser.* No. 275. H. M. Stationery Office, London, 1951, p. 193.
2. Krebs, E. G.: Depression of gamma globulin in hypoproteinemia due to malnutrition. *J. Lab. and Clin. Med.* 31: 85, 1956.
3. Anderson, C. G., and Altmann, A.: The electrophoretic serum-protein pattern in malignant malnutrition. *Lancet* 1: 203, 1951.
4. Trowell, H. C., Davies, J. N. P., and Dean, R. F. A. *Kwashiorkor.* Edward Arnold Co., London, 1954, p. 166.
5. Annotation: Agammaglobulinemia. *Brit. Med. J.* 2: 32, 1955.
6. Williams, C. D.: Kwashiorkor; nutritional disease of children associated with maize diet. *Lancet* 2: 1151, 1935.
7. Leading Article: Diet and immunity. *Lancet* 1: 933, 1953.