



Title	Immunoelectrophoretic Study of β -Globulin in the Serum in Dengue Haemorrhagic Fever
Author(s)	Jayavasu, Jidbhong; Jayavasu, Chuinrudee; Phengsrithong, Chandana et al.
Citation	Biken journal : journal of Research Institute for Microbial Diseases. 1967, 10(4), p. 253-255
Version Type	VoR
URL	https://doi.org/10.18910/82888
rights	
Note	

The University of Osaka Institutional Knowledge Archive : OUKA

<https://ir.library.osaka-u.ac.jp/>

The University of Osaka

PRELIMINARY REPORT

IMMUNOELECTROPHORETIC STUDY OF β_{1c} -GLOBULIN IN THE SERUM IN DENGUE HAEMEORRHAGIC FEVER¹

JIDBHONG JAYAVASU, CHUINRUDEE JAYAVASU, CHANDANA PHENGSRITHONG, AROONSRI ANAVIL and PRAKORB TUCHINDA

Virus Research Institute, Department of Medical Sciences, Ministry of Public Health, Bangkok, Thailand

(Received September 9, 1967)

The study presented here was undertaken to detect qualitative changes of β_{1c} -globulin in the serum in the active phase of dengue haemorrhagic fever. This serum globulin is particularly interesting because it is a component of the complement (MÜLLER-EBERHARD, *et al.*, 1960), and has been found to change in certain immunological and physiological conditions (HORNUNG and ARQUEMBOURG, 1964). An understanding of this protein, therefore, might provide information on the role of the complement in dengue haemorrhagic fever.

β_{1c} -globulin is the best antigen of the components of complement and it also produces the highest titre of antibody in immunized animals. On immunoelectrophoresis, this protein can be clearly located with rabbit anti-normal human serum (Fig. 1) or with rabbit antiserum against the serum proteins precipitated from fresh human serum by dialysis for 24 hours at pH 5.4 (Fig. 2). On aging, this protein undergoes distinct physicochemical changes, and the altered protein has greater electrophoretic mobility causing a characteristic double arc pattern which can be easily recognized.

In this study, sera from acute and convale-



FIGURE 1 Immunoelectrophoretic pattern developed by specific rabbit anti-human serum diffused against whole serum. β_{1c} -globulin arcs are indicated by the arrows.



FIGURE 2 Immunoelectrophoretic pattern developed by specific rabbit anti-human serum proteins precipitated from fresh serum by dialysis for 24 hours at pH 5.4. The double arc pattern of β_{1c} -globulin and the physicochemically altered protein, β_{1A} -globulin are indicated.

scient cases of serologically proven dengue haemorrhagic fever were used. The sera were used immediately or stored at 4°C for not longer than 7 days before use. Immunoelectrophoresis was carried out by the method of SCHEIDEGGER (1965) on 1.2% agar gel in pH

¹ A part of this work was presented at the First Southeast Asian Regional Seminar on Tropical Medicine in Bangkok on Aug. 8, 1967.



FIGURE 3 Immunoelectrophoretic pattern of serum from a case of dengue haemorrhagic fever developed by specific rabbit anti-human serum diffused against whole serum. The arrows indicate the β_{1c} -globulin arcs which were faint.

8.6 barbitone acetate buffer. β_{1c} -globulin was recognized by the position of the precipitin line formed between the β_1 and β_2 regions on reaction with rabbit anti-human serum.

Of 38 pairs of sera tested, 33 showed decrease of β_{1c} -globulin to an undetectable level (Fig. 3) while all 32 of the controls had apparently normal globulin (Table 1). An attempt was made to correlate these findings with the clinical manifestations of the disease

TABLE 1 *Correlation between the immunoelectrophoretic recovery of β_{1c} -globulin and sero-diagnosis of dengue haemorrhagic fever*

Sero-diagnosis	Number of cases	β_{1c} -globulin positive		β_{1c} -globulin negative ¹⁾	
		cases	%	cases	%
Dengue infection	38	5	13.1	33	86.9
Normal control	32	32	100.0	0	0

¹ A decrease, i.e., undetectable by immunoelectrophoresis.

TABLE 2 *Relationship between immunoelectrophoretic recovery of β_{1c} -globulin and clinical manifestations of dengue haemorrhagic fever*

Clinical manifestations	Number of cases	β_{1c} -globulin positive	β_{1c} -globulin negative ¹⁾
Pyrexia with symptoms other than haemorrhage	18	3	15 (83.3%)
Mild haemorrhage (petechiae or ecchymosis)	8	2	6 (75.0%)
Severe haemorrhage (haematemesis or internal bleeding)	9	—	9 (100.0%)
Shock	2	—	2 (100.0%)

¹ A decrease, i.e., undetectable by immunoelectrophoresis.

and the results are tabulated in Table 2. β_{1c} -globulin was not detectable in 15 of the 18 cases who had pyrexia with symptoms other than haemorrhage or shock. This finding was similar to that in mild haemorrhagic cases in which sera from 6 of the 8 cases contained no detectable β_{1c} -globulin. The same was also found in all cases of severe haemorrhage and shock.

These results show that during the active phase of dengue haemorrhagic fever, there is a definite decrease of β_{1c} -globulin to a level

which is undetectable by qualitative immunoelectrophoresis. The number of cases showing seems to increase with the severity of their clinical manifestations, although, few cases of severe haemorrhage and shock were examined.

According to Mayer, a decrease in complement titre in a disease could have at least 4 causes, namely: 1) complement fixation by antigen-antibody complexes or aggregated γ -globulin, 2) decreased formation of one or more of the components, 3) increased breakdown or loss of complement, or 4) formation

of an inhibitor (MAYER, 1961). It is too early to draw any definite conclusion on the cause of the decrease in β_{1c} -globulin in dengue haemorrhagic fever observed in this work. However, this protein is likely to be synthesized in Kupffer cells and other tissue macrophages, particularly in view of their abundance in liver, lymphoid tissues, and peritoneal exudate cells (THORBECKE, *et al.*, 1965). A decrease in its level in the serum, therefore, could result from any factor affecting the function of these cells. In pathological studies of dengue haemorrhagic fever, changes in the liver such as

acidophilic necrosis of the Kupffer cells and liver cells were noted (BHAMARAPRAVATI, *et al.*, 1966). These cellular changes might be one cause of the lowered β_{1c} -globulin level in the serum during the active phase of the disease of this study.

ACKNOWLEDGEMENTS

We are grateful to Drs. T. Amano, K. Inoue and S. Tanabe, Department of Bacteriology, Osaka University Medical School, Osaka, Japan, for their assistance in the confirmation and interpretation of the results of this study.

REFERENCES

- BHAMARAPRAVATI, N., BOONYAPAKNAVIK, V. and NIMSOMBURANA, P. (1966). Pathology of Thai Haemorrhagic Fever: An autopsy study. *Bull. Wld Hlth Org.* **35**: 47-48.
- HORNUNG, M. and ARQUEMBOURG, R. C. (1965). β_{1c} -globulin: An "acute phase" serum reactant of human serum. *J. Immunol.* **94**: 307-316.
- MAYER, M. M. (1961). in "*Experimental Immunochimistry*" E. A. Kabat and M. M. Mayer eds. Charles C. Thomas, Springfield, III. 2nd edition.
- MÜLLER-EBERHARD, H. J., NILSSON, U. and ARONSON, T. (1960). Isolation and characterization of two -glycoproteins β_1 of human serum. *J. Exp. Med.* **111**: 201-215.
- SCHEIDEGGER, J. J. (1955). Une micro-methode de l'immuno-electrophorese. *Intern. Arch. Allergy Appl. Immunol.* **7**: 103.
- THORBECKE, G. J., HOCHWALD, G. M., van FURTH, R., MÜLLER-EBERHARD, H. J. and JACOBSON, E. B. (1965). Problems in determining the sites of synthesis of complement components, in "*Complement*" 99-119, Ciba Foundation Symposium. J. & A. Churchill, Ltd., London.