

Complement Activity in Protein-Calorie Malnutrition

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BACKGROUND: Several defective host defense mechanisms have been implicated by us and others as increasing the susceptibility of children with protein-calorie malnutrition (PCM) to infection. Recent studies described elsewhere in this Annual Report have indicated that complement protein concentrations are abnormally low in untreated PCM. In an effort to further evaluate the competence of the complement system, 28 children with PCM were evaluated for serum hemolytic complement (CH₅₀) activity and for anti-complementary (AC) activity during the acute phase of the disease and throughout recovery.

METHODS: Children were studied on admission and on hospital days 2, 4, 8, 29, 71, and 84 for CH₅₀ and AC activity. CH₅₀ was measured using standard methods. AC activity was measured by mixing equal volumes of unheated patients' serum with standard serum of known CH₅₀ titer. The CH₅₀ activity of the mixed sera was then determined. Dilution controls were also run. The sera of 48 well-nourished Thai children mixed with a standard serum always resulted in a titer of 480 units/ml or more. If a serum (PCM) reduced the standard serum CH₅₀ activity to below 480 units/ml after mixing, the PCM serum was considered to contain AC activity. The 48 normal Thai children all had serum CH₅₀ titers greater than 160 units/ml. Thus a CH₅₀ titer was considered abnormally low in PCM if it measured less than 160 units per ml.

RESULTS: Serum CH₅₀ activity was depressed in 60% of children with PCM on hospital admission (Figure 1). After nutritional repair there were fewer patients with depressed CH₅₀ activity. Anti-complementary activity was present during the first week after admission in the plasma of 50% of children studied (Figure 1). After nutritional repair the number of patients showing AC activity decreased or disappeared. The patient group which received 4 gms of protein/kg/day appeared to have more rapid regeneration of CH₅₀ activity than the group receiving 1 gm of protein/kg/day.

The low complement functional activity may reflect the low complement protein concentrations found in PCM. Like complement protein concentrations, the low hemolytic complement activity responds better to a high protein than to a low protein diet. Depressed CH₅₀ activity may be in part due to depressed complement synthesis in protein starvation and to the presence of AC activity in some sera. The nature of the AC activity (immune complexes or endotoxin) is being investigated. In addition, studies of C3 turnover with ¹²⁵I labelled C3 have been initiated in order to determine whether the depression in CH₅₀ activity may be secondary to increased consumption of complement in PCM.

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Figure 1. Serum hemolytic complement (CH₅₀) and anti-complementary (AC) activity in PCM patients during convalescence

