



Alterations in Body Fluids- Blood (Plasma, Erythrocytes, Leucocytes), Edema Fluid and Saliva as Indicators of Nutritional Status

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Abstract

In blood plasma and erythrocyte F α AN (Free Alpha Amino Nitrogen) and non-essential: Essential amino acid ratios were neither definitive nor early indicators of hypoproteinemia. Erythrocytes showed significant increase in glutamic acid. Erythrocytes have a long survival time (around 100 days) therefore; may not represent the recent changes. The F α AN in leucocytes was reduced in hypoproteinemia. The leucocytes life span is 13 to 20 days, thus fall in F α AN may be the earliest change in blood for diagnosis of protein deficiency.

The concentrations of protein, F α AN and non-essential and essential amino acids ratio distributions in plasma and edema fluid were similar in Protein Energy Malnutrition (PEM), nephrotic syndrome, cirrhosis and congestive heart failure, so no further study was done.

The studies on saliva showed that decrease in ferritin level in PEM was a sensitive early indicator, protein also decreased. The salivary iron was increased two times of serum level in PEM, unrelated to iron deficiency anemia, and compared to serum levels in iron overload conditions.

Keywords: Nutritional Status; PEM; F α AN; Nonessential: essential amino acid ratios; Plasma; Erythrocyte; Leucocyte; Hypoproteinemia; Edema fluid; Saliva; Ferritin

Mini Review

Blood alterations in nutritional disorders

Plasma: Free α -Amino Nitrogen (F α AN) decreased in pregnancy, severe hypoproteinemia, cirrhosis and anemia. The non-essential: essential amino acid ratios were increased in hypoproteinemia and anemia [1].

Erythrocyte: F α AN content increased in early hypoproteinemia, but values became lower than normal in severe hypoproteinemia. F α AN increased in anemia, due to increased cellular non-essential amino acids [1].

The erythrocyte enzymes of glutamic acid metabolism (glutaminase I, glutaminase II, glutamic acid decarboxylase and glutamine synthetase) and related amino acids (glutamine, glutamic acid, aspartic acid, alanine, and γ -aminobutyric acid) increased in hypoproteinemia. The concentration of glutamic acid was increased suggesting increase in intracellular production [2], besides glucose, it may be an additional nutrient for cell function [3-5].

Leucocyte: The leucocytes life span is 13 days to 20 days, thus fall in F α AN could be the earliest change in blood for diagnosis [1].

Edema fluid

Plasma/edema ratios were 36: 1, 49: 1, 32: 1 and 52: 1 in PEM, nephrosis, cirrhosis and CHF, respectively. Ratios were 4: 1 and (21: 1) in epidemic dropsy and nephritis. The free alpha amino nitrogen and essential and non-essential amino acid in these two compartments were in equilibrium [6]. As plasma and edema fluid ratios were similar in PEM, nephrosis, cirrhosis and CHF, thus no further work was done.

Saliva

Saliva is basically an ultra-filtrate from serum, containing various substances i.e., protein, ferritin, enzymes (amylase, arginase, catalase, peroxidase), and sodium, potassium, thiocyanates,

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iodides and metals (iron, zinc, copper and chromium). Therefore, blood changes in protein, enzymes, may be reflected in PEM. The salivary ferritin showed a progressive fall in serum and saliva in PEM grade I (early malnutrition). In grade III the mean ferritin value was 3.28 ± 0.75 ug/L as compared to 169.3 ± 21.9 ug/L for normal children [7]. It was possible that these children with PEM also had associated anemia. The salivary iron in Iron Deficiency (IDA), thalassemia major and aplastic anemia was significantly higher. IDA children with hypoalbuminemia had significantly reduced serum and salivary protein, but iron concentrations in saliva was 2 times of the serum level. The salivary iron levels were increased in IDA as well as in iron overload. The mean salivary/serum iron ratio was twice in IDA (2.6), in thalassemia major (1.2) and aplastic anemia (1.1) times. Salivary iron levels are higher in iron deficiency [8], thus can be used for the diagnosis of iron overload and deficient states [9,10].

Conclusion

The fall of leucocyte FcAN, and salivary ferritin were sensitive diagnostic indicators of PEM. Salivary iron levels remain high in iron deficiency as well as in iron overload conditions.

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