A COMPARATIVE STUDY OF BIOCHEMICAL INDICES USED IN EVALUATING DIETARY PROTEIN IN YOUNG CHILDREN

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Various biochemical indices have been suggested for use in the diagnosis or assessment of relative protein deficiency. Such indices are also essential for measuring the response of infants with kwashiorkor to various forms of treatment. Most workers have agreed that concentration of albumin in the serum is probably the most satisfactory single index of deficiency or response to treatment. In the present study we attempted to define numerical ranges in serum-albumin concentration which might be associated with different states of protein nutrition. We also compared changes in albumin concentration with changes in the concentration of 2 other serum proteins and support the conclusions based on changes in the serum-albumin concentration with changes in the serum-albumin concentration.

Protein Nutritional Status and the Related Serum-albumin Concentrations

According to our experience of the treatment of infants with kwashiorkor, the concentration of albumin in the serum increases for several weeks and then reaches a plateau. Conversely, when a well-nourished infant receives an inadequate protein diet, the concentration of serum albumin eventually begins to fall until signs of acute deficiency appear. Presumably there might be definite numerical ranges in serum-albumin concentration which could be associated with these phases. We have attempted to define these ranges using data from 160 subjects in various states of protein nutrition. The mean concentration (plus and minus one standard deviation) of serum albumin is respectively, during acute deficiency 1.80 (1.31-2.29) g./100 ml.; during marginal protein nutritional status 3.15 (2.78-3.52) g./100 ml.; and after repletion 3.84 (3.50-4.18) g./100 ml. Obviously such ranges will depend on the particular method and laboratory used in accumulating the data. We have used the biuret method with a 27% sodium sulphate solution at 37°C to precipitate the globulins and standardized with Kjeldahl estimations of serum nitrogen.

Comparison of Dietary Proteins

We tested the correlation of serum albumin on serum-cholinesterase concentrations in another series of 127 subjects at various stages in repletion. This correlation was found to be statistically significant. The concentrations of these 2 biochemical indices were used to compare 80 infants in various states of protein nutrition and to measure their response to milk, mixed, and various vegetable-protein diets. Twelve of these 14 diet comparisons were shown to be statistically different using change in serum albumin as the sole criterion. Serum of these 14 comparisons were found to be statistically different using change in serum-cholinesterase as the criterion.

These 2 biochemical indices plus changes in serum-cholesterol concentrations were also used to compare 2 diets which contained the same quality and quantity of fat. The study was a controlled field trial at an orphanage and compared the supplementary effects of lysine and glycine on a basic wheat diet. Statistical differences were found in 3 of the 4 experimental periods when the change in serum-albumin concentration was used as the criterion; 4 were found different when the change in serum-cholinesterase was used and 2 were found different when the change in serum-cholesterol concentration was used as the criterion.

SUMMARY

Numerical boundaries for serum-albumin concentration have been described for infants at 3 stages of protein nutrition: acute deficiency, 1.31-2.29; marginal protein nutritional status, 2.78-3.52; and repletion, 3.50-4.18 g./100 ml. Changes in the concentration of serum cholinesterase and cholesterol (where the diets contained the same quality and quantity of fat) appear to be useful criteria for the evaluation of dietary proteins and support the conclusions based on changes in the concentration of serum albumin and in body weight.

REFERENCE

Krul, L. H.; Unpublished data.

DAILY PARTITION OF URINARY NITROGEN AND NITROGEN BALANCE DURING TREATMENT OF PROTEIN-DEPLETED INFANTS

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Urinary nitrogen was first partitioned into 5 components in 1905 by Otto Folin. From this early study of a human subject maintained on a constant diet for 1 week, Folin derived his concept that nitrogen metabolism was made up of exogenous and endogenous aspects. Greater understanding of methodology and an intense interest in the metabolism of various syndromes have made similar investigations under various conditions periodically necessary and informative. The purpose of the present investigation is to correlate nutritional status with changes in various urinary nitrogenous constituents.

Partition of urinary nitrogen into 7 components and complete nitrogen balance was conducted daily throughout the repletion of 6 infants with kwashiorkor. After receiving electrolyte therapy for the first 12-24 hours, the infants were put on milk diets. Three of them received milk ad lib. and 3 received a lesser amount of milk for 10 days, followed by an isonitrogenous substitution of maize. We were unable to distinguish a difference in the urinary constituents when maize was substituted isonitrogenously for milk in these 3 infants as long as we corrected for the difference in absorption. Therefore the diet for infant I has been referred to as a low-protein diet. Urine from a healthy, active child living in a home environment was also collected for 2 weeks and partitioned.

The question as to what is the best expression of particular data is often a very perplexing one. This is especially true when the subjects are heterogeneous by certain criteria and/or are in an especially dynamic state. We have attempted to express our data in such a way as to reflect possible shifts in metabolism which might occur during the repletion of protein-depleted infants.

Urea/mg/(absorbed nitrogen/day). The excretion of urea was low in our protein-depleted infants as expected. The effect
of increasing nitrogen intake on urea excretion was also clearly demonstrated. There was a tenfold increase in excretion by infants receiving milk ad lib. compared with no change in those receiving the low-protein diet. When the difference in intake as well as absorption was corrected for by using the expression percentage of absorbed nitrogen, the increase in urea excretion with treatment was much more uniform for all 6 of the infants. This twofold increase in urea excretion was probably a better reflection of the increased turnover rate of protein metabolism which would be associated with repletion.

Ammonia(mg./day). There was no apparent change in ammonia excretion by these infants from the second day of hospitalization (after electrolyte therapy) until cure was judged to be initiated.

Amino-acids(mg./mg. urinary creatinine/day; mg./(absorbed nitrogen/day). These data clearly demonstrated the development and recession of the increased amino-aciduria which we have previously reported \(^2\) during the treatment of infants with kwashiorkor. The effect of nitrogen intake on excretion was confirmed and demonstrated the need for expressing such data as a function of absorbed nitrogen.

Uric acid(mg./day). The excretion of uric acid in both groups increased significantly during repletion.

Creatinine(mg./day). Difference in creatinine excretion between the 2 groups of infants receiving the high and low protein intakes was apparent within 10 days. This difference probably reflected the difference in the rate of accumulation of muscle mass by the 2 groups.

Creatine(mg./day). Creatine excretion increased markedly in the infants receiving milk ad lib. The decrease in excretion by 1 of these infants to admission levels occurred several days before signs of a concurrent infection were recorded. Creatine excretion fell uniformly in the infants receiving the low-protein diet.

Nitrogen retention(mg./absorbed nitrogen/day).

Urea excretion with treatment was much more uniform for all infants receiving milk ad lib. The decrease in nitrogenuous excretion by these infants from the second day of treatment was much less when the difference in nitrogen retention continued (approximately 20% of absorbed nitrogen after 2 weeks of treatment). It also appeared, in these subjects at least, that the day-to-day variation in nitrogen retention could be accounted for almost entirely on the basis of stage of depletion, and variation in absorption and/or intake.

**SUMMARY**

Basic data on nitrogen retention and the excretion of various end-products of nitrogen metabolism have been accumulated continuously throughout the treatment of infants with kwashiorkor. These data reflect the degree of protein deficiency in the infants and the quantitative differences in the dietary protein and/or absorption. Qualitative differences in dietary protein however, were not demonstrated in this series.

**REFERENCES**


**ABSTRACT : UITTREKSEL**

**UNSATURATED FATS IN FOODS**

As a result of the recent practice of advertising the presence of unsaturated fats in foods, the Food and Drug Administration of the United States of America has declared, in its Federal Register, that any claim, direct or implied (in the labelling of fats and oils or other fatty substances offered to the general public) that these substances will prevent, mitigate, or cure diseases of the heart or arteries, is false or misleading and constitutes misbranding within the meaning of the Federal Food, Drug, and Cosmetic Act.

**ASSOCIATION NEWS : VERENIGINGSNUIJS**

**CAPE WESTERN BRANCH**

A circular letter from the Hon. Secretary of this Branch is reproduced below for the information of members of the Association:

**CHEQUES FROM THE SOUTH AFRICAN MUTUAL MEDICAL AID SOCIETY**

I wish to draw the attention of members to a new form of cheque being used by the above Society, and particularly to column 1 of the cheque which is titled 'Payment Codes'. This payment code reads from 1-8.

The wording of Code 4/5 is such that the cheque value is according to the Medical Aid Tariff and is tendered in 'full settlement' of the gross amount of the account.

If members are not prepared to accept this, Branch Council recommends that cheques coded 4/5 be returned with the request that they be re-coded to 6, which reads:

'Attached is a cheque payable to you. The amount of the cheque represents the benefit payable by the Society on the account detailed hereon.'

Any balance between the cheque value and the full account can then be claimed from the patient.

Undetermined nitrogen(mg./day). The urinary excretion of 'undetermined' nitrogen was understandably irregular since it was estimated by difference and thereby reflected the irregularities and error in the estimation of the 7 other nitrogenous components. There was a significant increase in the absolute excretion by those infants with the high-protein intake.

Nitrogen retention(mg./(absorbed nitrogen/day). These observations on continuous nitrogen balance clearly illustrated several of the principles discussed in a recent publication \(^1\) on balance studies conducted in our unit. For example, the mean retention was greater during the first few days of treatment (approximately 65% of absorbed nitrogen) and became less as repletion continued (approximately 20% of absorbed nitrogen after 2 weeks of treatment). It also appeared, in these subjects at least, that the day-to-day variation in nitrogen retention could be accounted for almost entirely on the basis of stage of depletion, and variation in absorption and/or intake.

**TAKE WES-KAAPLAND**

'n Omsendbrief van die Eresekretaris van hierdie tak word hier weergegee ter inligting van lede van die Vereniging:

TJEKS VAN DIE SUID-AFRIKAANSE ONDERLINGE MEDIESE HULPVERENIGING

Ek wil die aandag van lede vestig op die poneering van "n nuwe soort tjek wat hier weergegee ter inligting van lede van die Vereniging:

Die bewoording van kode 4/5 is so dat die waarde van die tjek gebaseer is op die mediese hulptarief en dat dit aangebicd word as ,volle vereffening' van die totale bedrag van die rekening.

Die bewoording van kode 4/5 is such that the cheque value is according to the Medical Aid Tariff and is tendered in 'full settlement' of the gross amount of the account.

If members are not prepared to accept this, Branch Council recommends that cheques coded 4/5 be returned with the request that they be re-coded to 6, which reads:

'Attached is a cheque payable to you. The amount of the cheque represents the benefit payable by the Society on the account detailed hereon.'

Any balance between the cheque value and the full account can then be claimed from the patient.

The FDA states that the rôle of cholesterol in heart and artery diseases has not been established; that a causal relationship between blood-cholesterol levels and those diseases has not been proved; and that it has not been demonstrated that it is advisable for Americans to make extensive changes in the nature of the fat they eat.