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Biotin in the Treatment of Uremic Neurologic Disorders

By Joy Lutz-Mizar, MS, RD, CNIS. *Joy is the regional dietitian for the Los Angeles Region of FMC-na. She can be contacted at nutrcareent@msn.com.* *This article was originally published in Diagnostic Nutrition Network, October, 2004, Vol 13, No. 2.*

Introduction

Biotin, also known as Vitamin H or vitamin B7, is a B complex vitamin with a wide range of roles in the intermediary metabolism of carbohydrates, fats and amino acids(1). Known deficiency syndromes of inborn errors of metabolism which are biotin responsive have been adequately elucidated, as well as biotin deficiency induced by the biotin binding properties of avidin(1,2). However, there has been a paucity of literature evaluating the value of nutritional treatment of uremic neurologic disorders with biotin; this paper will attempt to evaluate the role of biotin in the treatment of certain neurologic disorders in ESRD patients on maintenance hemodialysis.

Background evidence

Biotin is a water-soluble vitamin which is abundant in the diet. Good sources of biotin include liver, egg yolk, wheat bran, avocado, cauliflower, cheese, salmon and pork(3). Biotin is also produced by intestinal bacteria, though its bioavailability for absorption is unclear(4). Biotin's role in intermediary metabolism is that of a cofactor in reactions involving four carboxylases. (see Table 1).

Definition of biotin deficiency

Based on its role in intermediary metabolism, biotin deficiency may be defined as the state of insufficient quantities of the vitamin in the body to meet the requirements for four carboxylase reactions. This deficiency may be viewed as relative (biotin-responsive disorders) or absolute (true biotin deficiency). The requirement for biotin in healthy individuals has been established for adults at 30 mcg per day. Biotin is generally recognized as safe, even with oral doses as high as 200 mg per day(5). Biotin deficiency is diagnosed in otherwise healthy patients via urinary excretion studies.

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Table 1. Functions of biotin-dependent carboxylases (5)

acetyl CoA carboxylase	catalyzes the binding of bicarbonate to acetyl CoA to form malonyl CoA
methylcrotonyl CoA carboxylase	catalyzes an essential step in the metabolism of the essential amino acid leucine
propionyl CoA carboxylase	catalyzes essential steps in the metabolism of amino acids, cholesterol, and odd chain amino acids
pyruvate carboxylase	catalyzes the ATP-dependent carboxylation of pyruvate to form oxaloacetate, utilized in the TCA cycle synthesis of glucose, fat, some amino acids or derivatives and several neurotransmitters

In This Issue:

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Sharon Griff, MBA, MS, RD
2020 St. Johns Avenue, #210
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FROM THE EDITOR'S DESK

Welcome to 2006!

As each New Year begins I always take the time to look back at the previous year to assess and evaluate my life. I do this to ensure that I am expanding my "horizons" both professionally and personally.

Unfortunately, when I speak to many of my colleagues, what I hear over and over again is how things don't change when working in a dialysis clinic. We see the same patients day after day to the point that we know what they are going to say to us before they say it. We review the lab reports on the same week, month after month. Due to the nature of our role as clinician in treating a chronic disease, it is important for each of us to explore ways to break this monotony within our routine. This will help ensure that we maintain a "cutting edge" in our field and avoid burn out and boredom.

We should set an example for all of our patients to live life to the fullest each day. Therefore I challenge each of you to start breaking through the monotony. It's never too late to make a change! The time is now to start something new in your professional life or your personal life or even both. This could be as simple as starting a journal club with your co-workers to keep everyone up to date on the latest clinical research. Another option would be to join a new organization to network and learn from others who are outside your specialty or field.

For example, in the Advances in Practice section, Philippa Norton Feiertag examines the impact of nutrition and exercise on the outcomes of dialysis patients. Why not put this into action and organize a team to work on implementing an exercise program in your dialysis clinic. Or, review Joy Lutz Mizar's article in a journal club format and evaluate the role of biotin, a B complex vitamin, in the treatment of certain neurologic disorders in hemodialysis patients.

It is imperative that we take steps to break the monotony in order to provide optimum intervention strategies and care to our patients and allow for our own professional and personal growth. In short, if we don't break the monotony with positives changes, then our patients suffer too.

I invite you to email me at rnfeditor@yahoo.com to share your stories, experiences and pictures so that we can all benefit from your successes.

Let's begin this new year trying to make a change that will improve our life and our patients' lives too!

Sharon Griff

Many Thanks

Thank you to the following peer reviewers for this issue:

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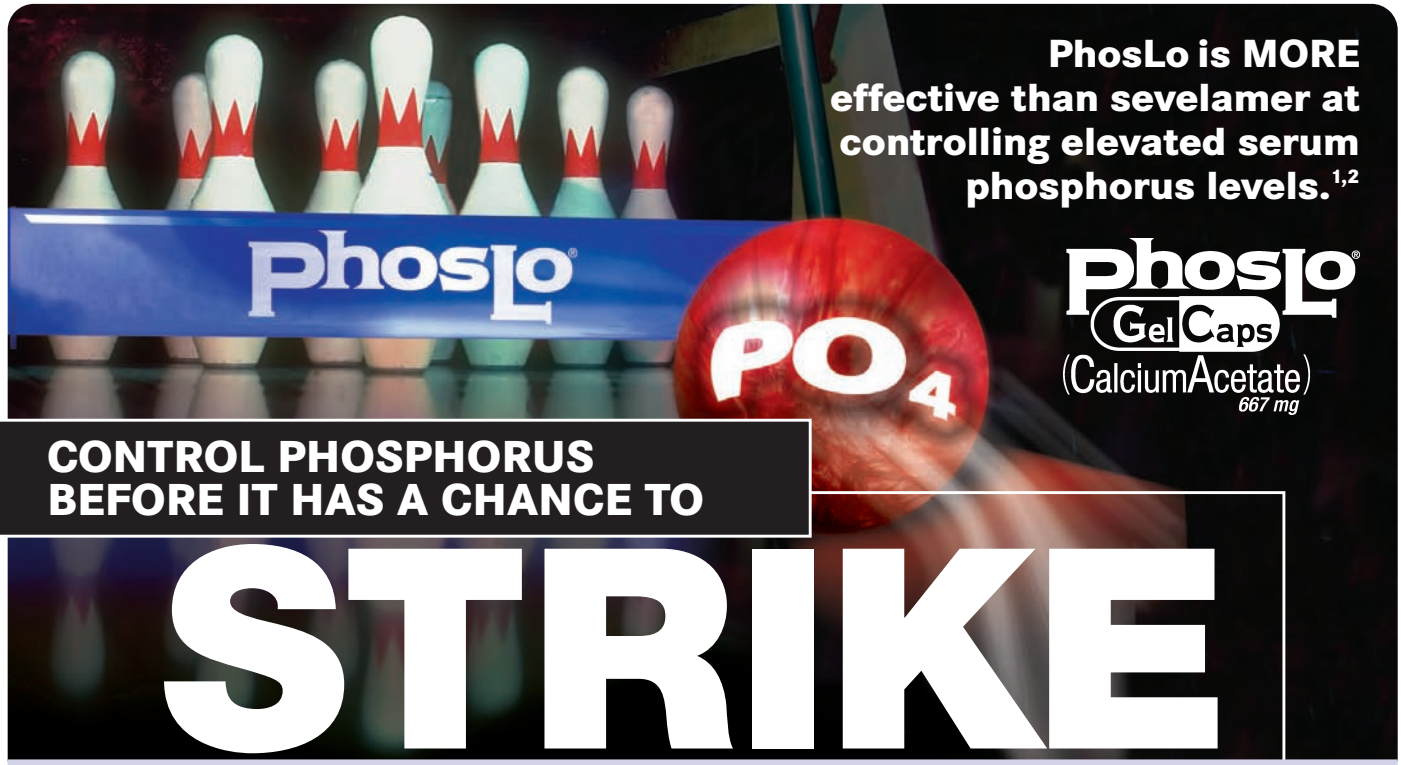

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PhosLo® Gel Caps (Calcium Acetate) 667 mg

CONTROL PHOSPHORUS BEFORE IT HAS A CHANCE TO STRIKE

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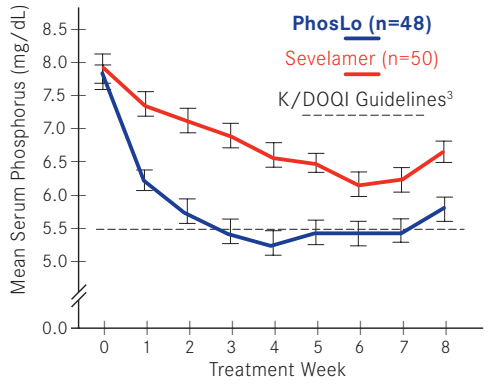

Attainment of NKF K/DOQI Bone Guidelines Among Dialysis Patients Referred for Transplantation[2]*

	Sevelamer (n=40)	PhosLo (n=67)	p-value
Serum P (mg/dL)	6.2	5.0	<0.001
Ca x P (mg^2/dL^2)	52	43	0.002
% P ≤ 5.5	38%	75%	<0.001
% Ca x P ≤ 55	65%	85%	0.03

*Cross-sectional study to compare the efficacy of longer-term calcium-based binder and sevelamer treatment in a series of 107 patients.

PhosLo® is indicated for control of hyperphosphatemia in end-stage renal failure. Patients with higher-than-normal serum calcium levels should be closely monitored and their dose adjusted or terminated to bring levels to normal. **PhosLo® is contraindicated in patients with hypercalcemia.** No other calcium supplements should be given concurrently with PhosLo.® Nausea, hypercalcemia and pruritus have been reported during PhosLo® therapy.

BRIEF SUMMARY OF PRESCRIBING INFORMATION

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References: **1.** Qunibi WY, Hootkins RE, McDowell LL, et al. Treatment of hyperphosphatemia in hemodialysis patients: the Calcium Acetate Renagel Evaluation (CARE study). *Kidney Int.* 2004;65:1914-1926. **2.** Nolan C et al. Attainment of NKF K/DOQI Bone Guidelines Among Dialysis Patients Referred for Transplantation. Abstract. *Journal of American Society of Nephrology*, Volume 16, 2005. American Society of Nephrology Renal Week. Pennsylvania Convention Center, Philadelphia, PA. November 8-13, 2005. **3.** National Kidney Foundation K/DOQI clinical practice guidelines for bone metabolism and disease in chronic kidney disease. *Am J Kidney Dis.* 2003;42(suppl 3):562-578.

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Biotin and its metabolites bisnorbiotin, biotind, l-sulfoxide, bisnorbiotin methyl ketone, and biotin sulfone exhibit decreased excretion in biotin deficient states(3,6). In addition, excretion of 3-hydroxyisovaleric acid (3-HIA) is elevated in biotin deficiency. Plasma levels of biotin are not sensitive indicators of biotin deficiency; in fact, plasma levels may be normal or even elevated in the face of clinically evident biotin deficiency. There are presently no validated indicators of biotin status in patients with renal insufficiency and renal failure(6). Biotin deficiency may be divided into two major categories, namely inborn and acquired. Inborn errors responsible for biotin deficiency include biotinidase and holocarboxylase synthetase (HCS) deficiencies and are beyond the scope of this paper (6). Acquired biotin deficiency is found in conditions including pregnancy, causing fetal abnormalities even with marginal biotin deficiency in the pregnant mother; dietary circumstances leading to biotin deficiency include avidin (from the ingestion of raw egg whites) which tightly binds biotin, preventing its absorption; TPN without adequate biotin supplementation; medication effects, including antibiotic and anticonvulsant therapies and hemodialysis which results in losses of biotin through the dialysate(1,5,7,8).

Table 2. Altered nutriokinetic mechanisms as causative factors in biotin deficient states and the development of nutritional injury disorders

Prekinetic	Insufficient intake of biotin in the renal diet(10) poor appetite dietary restrictions Increased requirements of biotin induced by TPN(3) effects of circulating metabolites(4)
Kinetic	
Absorption	Avidin(3,11) Biotinidase deficiency(5,11) Renal failure(10)
Distribution	Renal failure(10) Antibiotics/anticonvulsants(11,12)
Metabolism	Decreased bioavailability inherited(5) carboxylase deficiency biotinidase deficiency ? other acquired renal failure/uremic toxins(10) antibiotics(11) Increased catabolism anticonvulsants(12)
Excretion	Hemodialysis(13)

Nutriokinetics of biotin deficiency

The etiologies of biotin deficient states can be demonstrated via nutriokinetic pathways which examine the fate of nutrients in the body over time(9) (Table 2).

Hemodialysis patients may experience prekinetic biotin deficiency due to obligatory restrictions of certain foods in the diet, including biotin-rich foods. In addition, the process of hemodialysis results in significant excretion of biotin in the dialysate. This loss may be 30% according to the literature(13). Patients on anticonvulsant /prolonged antibiotic therapies are also at risk of biotin deficiency due to altered distribution / metabolism of biotin in the presence of these drugs(11,12). Meanwhile, supplementation of biotin in “renal” multivitamins is generally 300 mcg per day, equivalent to ten times the RDA for adults, but far below the 10mg biotin supplementation needed daily to correct uremic neurologic
disorders (14,15).

Physical manifestations of biotin deficiency

Overt signs of biotin deficient/responsive states are diverse, perhaps depending on the site(s) of the biotin-dependent carboxylase system affected. For example, deficiencies in the biotin / pyruvate carboxylase reaction may result in neurologic manifestations, while aberrations in the biotin /acetyl CoA carboxylase systems may produce glossitis. In addition, symptoms of biotin deficiency may differ, depending on whether the deficiency is inborn or acquired. Table 3 presents a summary of the overt symptoms of biotin deficiency. Biochemical manifestations of biotin deficiency include impaired glucose utilization, as well as impaired fatty acid and amino acid metabolism since biotin is a cofactor in enzymes required for these processes(1,16).

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Table 3. Selected overt signs and symptoms of biotin deficiency and nutritional injury (1)

Inborn	*Acquired*
hypotonia	hair loss
ataxia	glossitis
coma	dry eyes
dermatitis	scaly red rash (nasolabial and genital area)
mental retardation	biotin deficient face (unusual facial fat distribution, characteristic facial rash)
deafness	fatigue
Also:	depression
	nausea
	muscular pains

Biotin deficiency in hemodialysis patients.

The qicomic method of studying the interrelationships of/among the three dimensions of the QIC (Quality Improvement Cube), namely primary indicator, procedural, and population-specific, situates Registered Dietitians perfectly to study biotin deficiency in the ESRD population (17,18). A literature review reveals limited, but significant, information that biotin has been successfully used in the treatment of uremic neurologic disorders(14,15).

Deeper review of the literature delineates specific instances of biotin deficient/responsive states, as well as the association of biotin to the various carboxylases, especially pyruvate carboxylase, which, with biotin as a co-factor, is involved in the synthesis of certain neurotransmitters(19,20). It may be inferred that it is at this point, in the face of a biotin deficiency, that the neurologic disorders of hemodialysis patients are manifest.

In addition, qicomics allows the dietetic practitioner working with potential biotin deficiency in hemodialysis patients to move logically along the nine-step nutritional care process in search of a nutritional diagnosis (using the nutrition injury-specific diagnostic codes/etiologies), goals for treatment, interventions, and outcomes(21). The process involves continued "black box" thinking to move forward in thought processes that will reveal further key information enabling the dietetic practitioner to discover deeper nutritional diagnoses, etiologies, interventions, and treatments.

Clinical study

Over the course of the last decade, this practitioner has treated at least a dozen hemodialysis patients with biotin, 10 mg per day to resolve hiccups and restless leg syndrome. All of these patients responded with complete or near complete resolution of their symptoms within 1 to 3 months of treatment. In order to document similar findings for the purpose of this study, a small cohort of outpatient hemodialysis patients with uremic neurologic disorders (one with hiccups, two with restless leg syndrome) was chosen to demonstrate the value of megadosing with biotin to treat their symptoms. Patients included in this study were chosen based on clinical findings of uremic neurologic symptoms. In addition, patients demonstrated a strong willingness to comply with the daily dosing regimen of the biotin supplements (5 mg twice daily), and an active interest in alternative therapies to treat their neurologic symptoms. Blood samples were not obtained since plasma levels of biotin do not correlate with biotin deficient states(6,22). Decreased urinary excretion of biotin does correlate with biotin deficiency, but this also was not attempted due to the oliguric/anuric states of these patients(6,22,23).

Discussion

Each of the patients in this small study had pre-existing neurological problems which progressively worsened once hemodialysis was initiated. This may suggest that these patients had pre-existing biotin deficiency, though none of these patients had any of the known risk factors for biotin deficiency. It may also be speculated that they had some unknown biotin-responsive disorder, such as a latent carboxylase deficiency or a problem in the absorption or metabolism of biotin, including the effects of renal insufficiency. Of note also is that only one of these patients exhibited possible overt physical symptoms of biotin deficiency, namely smooth tip of tongue and a naso-labial rash. Perhaps the specific carboxylase pathway affected dictates the manifestation of the symptoms of

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biotin deficiency. In the case of uremic neurologic disorders, it may be that the biotin-dependent pyruvate carboxylase pathway is somehow altered, thus limiting the synthesis of certain neurotransmitters.

The capacity of the Registered Dietitian (RD) to recognize biotin as the deficient substance when evaluating uremic neurologic disorders is currently limited by a variety of factors, including inadequate testing methods, (blood tests are not reliable; urine tests are reliable, but not practical) and the relative lack of literature supporting the concept of biotin deficiency in hemodialysis patients. Dedicated use of the qicomic centered nine-step care process guides the RD to discovery necessary to make the appropriate nutritional diagnosis.

Nutritional Diagnosis

Biotin is not commonly used as the treatment of choice for uremic neurologic disorders. Perhaps this is related to the fact that current literature minimally elucidates instances and treatment of biotin deficiency in hemodialysis patients, even though aberrations in biotin metabolism and excretion are known to occur in chronic renal failure. Therefore, using the revised Nutritional Injury-Specific and Related Nutritional Diagnostic Categories/Codes (NDCs) a potential nutritional diagnosis gleaned from these case studies, with limited literature supporting biotin as a treatment for uremic neurologic disorders may be: *absence of/limited therapeutic normalization of conditions (as related to nutraceuticals), related to limited nutritional security systems*(18).

At the same time, these patients present at a stage 4 to 5 level of nutritional injury, as described in the Points of Care Nutritional Diagnostics, Interventions and Outcomes model developed by Kight and Parrington(17). In addition, review of the literature suggests that there may be some factors beyond a simple biotin deficient state that accounts for the uremic neurologic symptoms which preceded hemodialysis and worsened with initiation of dialysis. That is, there may be metabolic aberrations that account for the biotin-responsive neurologic symptoms. For example, defects in the biotinylation of pyruvate carboxylase in humans usually manifests as a psychomotor retardation according to Wallace(20). Further, biotin counteracts the inhibitory effect of uremic plasma on microtubule formation in chronic renal failure patients on maintenance hemodialysis(24). It is this effect that may at least partially explain why biotin improves symptoms of uremic neuropathy according to Braguer. Lastly, it has been speculated that uremic neuropathy may be a manifestation of axonal shrinkage, which is the result of a dysfunction of the neuron causing a decrease in the diameter and rearrangement of myelin(25). Therefore, an alternate nutritional diagnosis may be: *possibility of developing/presenting with a nutritional dysadaptation/ injury state related to alteration in metabolism/enzyme/gene expression.*

Conclusions

Treatment of uremic neurologic disorders, including hiccups and restless leg syndrome, with megadoses of biotin (10 to 20 mg per day) has been very successful in a small study group of hemodialysis patients. These patients resolved or nearly resolved their symptoms after 1 to 3 months of therapy; symptoms returned in one patient who temporarily discontinued treatment, and symptoms resolved again after resumption of biotin therapy. None of the patients experienced untoward side effects of the biotin therapy, and no other medical or surgical therapies were required to assist in resolving their uremic neurologic symptoms. Currently, two additional patients have been started on biotin, 10 mg per day, to relieve their uremic neurologic symptoms; their responses to biotin therapy have yet to be elucidated.

The patients in this study gleaned additional benefits from the biotin therapy, including:

Time benefit: There is a relatively short response time to biotin therapy in relation to length of time the patients endured neurologic symptoms and tested conventional medical therapies.

Cost benefit: Biotin by far is a cost-saving therapy compared to prescription medications; expense was not covered by insurance since biotin is an over-the-counter vitamin, but out of pocket expense was only about $6 per month.

Quality benefit: The quality of life was improved in all the study patients, including improved appetite and sleep patterns; less reliance on oxygen therapy (in the hiccups patient) and overall sense of well being in all patients.

Further study is clearly indicated to:

1) document clinical responsiveness of uremic neurologic disorders with megadoses of biotin in a more extensive

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randomized clinical trial of patients
2) attempt to differentiate between biotin deficiency and biotin responsive disorders
3) develop a methodology for validating a biotin deficient/ responsive state in oliguric/anuric patients
4) discover whether biotin-responsive uremic neurologic disorders are associated with other overt clinical signs of biotin deficiency, i.e. stage four or five nutritional injury
5) delineate the neurotransmitters responsible for altered neurologic function in cases of biotin deficiency

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ADVANCES IN PRACTICE:

Strategies for optimizing nutritional intake and improving functional status in elderly patients undergoing maintenance dialysis therapy.

By Philippa Norton Feiertag, MEd, RD, LD. *Philippa is a clinical analyst/renal nutrition specialist with Clinical Computing, Inc. in Cincinnati, Ohio. She can be reached at feier@fusenet.com.*

Over the past three decades, there has been a significant increase in the number of elderly patients receiving maintenance dialysis therapy (1-3). In 2001, the median age of patients undergoing maintenance hemodialysis (MHD) was 65 years compared with 54 years in 1978 (1). Analysis of data from 398,940 United States Medicare patients initiating dialysis between 1995 and 2000 indicated that 51% of patients were 65 years or older (2). The health outcomes of these elderly patients may be impacted not only by their kidney disease, but also by life events that accompany the aging process. These events may include retirement and change in financial status, loss of spouse and bereavement, and change in social networks (3).

Aging is associated with increased incidence of malnutrition and changes in body composition (4,5). Age greater than 65 years is a strong predictor of malnutrition among MHD patients (6). During the aging process, poor protein intake and reduced levels of physical activity promote loss of skeletal muscle, called sarcopenia (5). This may lead to a decrease in physical function and contribute to the falls that commonly occur in MHD patients (7). Clearly, the elderly patient with chronic kidney disease (CKD) undergoing maintenance dialysis therapy belongs to a high-risk group that is a prime target for intervention by the renal care team.

Medical nutrition therapy is recognized as an effective strategy for managing chronic diseases in elderly patients, and the American Dietetic Association also promotes regular physical activity to decrease age-related morbidity in older adults (8). This column will review the recommendations for meeting protein and calorie needs in elderly patients with CKD undergoing MHD, and the role of exercise in improving health and physical function in this population.

The National Kidney Foundation Kidney Disease Outcomes Quality Initiative (NKF K/DOQI) Clinical Practice Guidelines for Nutrition in Chronic Renal Failure recommend a dietary protein intake of 1.2 g/kg body weight/day for clinically stable MHD patients and 1.2-1.3 g/kg body weight/day for clinically stable chronic peritoneal dialysis (CPD) patients (9). At least 50% of the dietary protein intake should be of high biological value to maintain protein balance. This is the recommended intake that is considered to be the minimum amount that will maintain neutral or positive nitrogen balance in the vast majority of stable MHD patients. In addition, a daily energy intake of 30-35 kcal/kg body weight/day is recommended for MHD and CPD patients 60 years or older.

Despite these recommendations, many elderly patients with CKD undergoing MHD are at high nutritional risk because their dietary protein and energy intake is inadequate (2,4,6). In a recent study of 37 stable MHD patients, dietary intake was measured on one dialysis day and two non-dialysis days using three-day diet diaries (10). When intake of protein and energy was calculated and averaged for each patient, 70% had intakes lower than recommended by the NKF K/DOQI Guidelines (9). The age of patients with inadequate protein and energy intake was significantly higher (62.1±10.4 years) than patients who met their protein and energy needs (37.0±20.8 years).

The results of this study confirm findings from an earlier cross-sectional analysis of 1,397 MHD patients enrolled in the Hemodialysis (HEMO) Study (11). Two-day diet recalls obtained on one dialysis day and one non-dialysis day were analyzed for dietary protein and energy intake. Mean dietary protein intake for older patients (age ≥65 years) was 0.91±0.33 g/kg adjusted body weight/day and 42% of these patients had protein intake <0.8 g/kg/day. Older patients also had low mean dietary energy intake (21.9±7.5 kcal/kg/day). Assessment of indicators of nutritional and functional status during this study revealed that older patients had significantly lower serum albumin levels and a significantly higher degree of physical disability than patients who were younger (age <50 years) or middle-aged (age 50-64 years).

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These findings may be related to poor dentition, prescription of multiple medications and taste dysfunction, all of which occur commonly in the aging population. Loss of dentition and/or wearing poorly fitting dentures contributes to poor nutritional status and underscores the need for routine preventive and corrective intervention by a dentist and dental hygienist (3). Individualization of drug therapy in elderly patients is particularly important to maximize effectiveness and decrease the need for multiple medications which can result in taste changes, nausea and appetite loss (3).

Changes in peritoneal membrane characteristics may further impact nutritional status in elderly patients undergoing CPD. In a study designed to investigate changes in nutritional status and peritoneal membrane transport characteristics with aging, 229 non-diabetic patients undergoing continuous ambulatory peritoneal dialysis (CAPD) were assigned to three groups: elderly (age ≥65 years), middle-aged (50-65 years) and young (age <50) (12). Although protein catabolic rate (PCR) did not differ significantly among the groups, mean serum albumin level was significantly lower. This may be attributed to the significantly higher peritoneal area and plasma protein losses across the peritoneum in the elderly group compared with middle-aged and young groups.

Findings from these studies emphasize the importance of increasing protein and energy intake in elderly patients with CKD undergoing MHD or CPD. Recommendations for optimizing protein and energy intake in this population include aggressive nutrition counseling, use of oral supplements, tube feeding and intravenous nutrition (2,9).

Elderly patients often have difficulty managing their nutrition intake at home and may lack the support needed to maintain adherence with interventions made by health care professionals (13). Preparation and delivery of cook-chilled meals consistent with renal nutrition guidelines for protein, energy, potassium, phosphorus and sodium may be helpful for patients with CKD undergoing maintenance dialysis therapy. However, while there is evidence that these foods are favorably accepted by users, their impact on health outcomes has not been investigated.

In another study, 80 non-renal patients age ≥75 years were randomized into a control group or a group receiving 200 ml oral supplement (500 kcal, 21 g protein) daily during and after hospitalization (14). Two months after hospital admission, significant weight loss had occurred in the control group but not in the supplemented group. The NKF K/DOQI Clinical Practice Guidelines for Nutrition also promote the use of high energy oral supplements to help patients with CKD meet recommended energy intake (9).

Results from a study of malnourished MHD patients indicate that providing oral supplements early in the course of malnutrition is more efficient and cost-effective than waiting until nutritional status has declined significantly (15). Patients with mild hypoalbuminemia (serum albumin 3.5 – 3.7 g/dl) were randomly assigned to control and experimental groups. The control group (mean age 58±8.6 years) received nutrition counseling to liberalize protein and calorie intake while the experimental group (mean age 64±10 years) received nutrition counseling and oral supplements (free of charge) to increase protein intake to 1.2 g/kg/day. Patients with moderate to severe hypoalbuminemia (serum albumin 2.5 – 3.4 g/dl) were assigned to a comparison group (mean age 68±10.5 years) and received one to three cans daily of oral supplements, which were provided by the patient's insurance plan or purchased by the patient.

During the six-month treatment phase, significantly more patients reached nutritional repletion, defined as serum albumin ≥3.8 g/dl for two consecutive months, in the control and experimental groups (57% and 50% respectively) than in the comparison group (7%). Overall, nutritional repletion occurred more quickly in the experimental group (3.2±1.7 months) than in the control group (3.5±1.2 months). Furthermore, during a three-month follow-up period, patients in the experimental group were much more likely to maintain nutritional repletion or continue to improve (61%) than patients in the control group (14%). This data suggests that early intervention with oral nutritional supplements helps larger numbers of patients to improve and maintain their nutritional status over a longer period of time.

Evidence suggests that oral supplements containing branched-chain amino acids (BCAA) may be particularly helpful in improving nutritional status in elderly patients on MHD (16). Twenty-eight malnourished MHD patients with ages greater than 70 years were randomly assigned

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to receive either placebo or BCAA supplement three times daily for six months, followed by the opposite treatment for six months. Change in nutritional status during the study period was evaluated using serum albumin concentration, body fat percentage and lean body mass. Dietary protein and energy intake was measured using seven-day diet records. Consumption of BCAA supplement resulted in rapid improvement in appetite and dietary protein and energy intake, which persisted throughout the supplementation period. Mean serum albumin increased significantly from 3.31 to 3.93 g/dl after three months, and anthropometric measurements improved significantly between three and six months. Dietary protein and energy intake and serum albumin concentration gradually decreased after BCAA supplementation was discontinued, but remained above baseline values. However, anthropometric parameters did not decrease. Thus, oral BCAA administration appears to have a rapid and sustained positive impact on nutritional status in elderly patients undergoing MHD.

Another study on elderly MHD patients showed beneficial effects of prolonged intradialytic parenteral nutrition (IDPN) on nutritional status (17). Ten non-diabetic patients age greater than 70 years on MHD for two years or more received IDPN containing glucose, essential amino acids and lipid emulsion during scheduled dialysis treatments for one year. Eighteen patients who did not receive IDPN served as the control group. Nutritional status was evaluated by measuring body mass index, triceps skinfold thickness, mid-arm circumference, mid-arm muscle circumference and serum albumin, transferrin and total lymphocyte count. Dietary intake of protein and calories was also determined. Serum albumin, transferrin and total lymphocyte count began to increase significantly after three months and anthropometric data began to increase significantly after six months of IDPN therapy. Patients who did not receive IDPN showed gradual decreases in all nutritional indices during the study period.

Appetite, mean protein and energy intake, estimated dry weight and serum albumin level in MHD patients may all increase as a result of participating in intradialytic exercise programs (18,19). Non-renal patients age ≥70 years and living at home also show significant improvement in balance and decreased incidence of falls when they exercise weekly (20). A recent study of falls in MHD patients with a median age of 70.9 years identified older age as an independent risk factor for falling and concluded that this population is a priority target for interventions, including exercise programs (7).

Functional disabilities and falls are linked to sarcopenia, the loss of muscle mass with aging (8). Strength training using progressive resistance training is regarded as the best intervention for slowing down or reversing sarcopenia and seems to be especially effective in reducing risk of falls (21). Exercise training in patients undergoing MHD increases the ability of muscles to use oxygen more efficiently, resulting in improved exercise capacity (22). Patients who participate in aerobic exercise and resistance training also show improved muscle strength and physical functioning (23-25). In these studies, patients participated in progressive resistance quadriceps and hamstring exercises, and trained on cycle ergometers.

A recent study suggests that if physical activity in the dialysis population is to be effective in improving their survival, patients need to exercise up to four to five times weekly (26). However, 56% of patients in a national cohort reported exercising less than once a week. Exercise programs that can be performed during dialysis improve participation rate, especially among elderly patients (27). Intradialytic exercise programs consisting of endurance training with a bed bicycle ergometer, gymnastics to increase muscle strength, flexibility and coordination, and relaxation techniques improve functional capacity even in very old patients.

Health outcomes in elderly patients undergoing maintenance dialysis therapy are affected by poor nutritional status and loss of skeletal muscle. Early intervention to increase protein and calorie intake via nutrition counseling and oral supplements, especially those containing BCAA, have been shown to improve biochemical and anthropometric parameters. Provision of intradialytic exercise programs also show promise as a means of improving patients' functional status.

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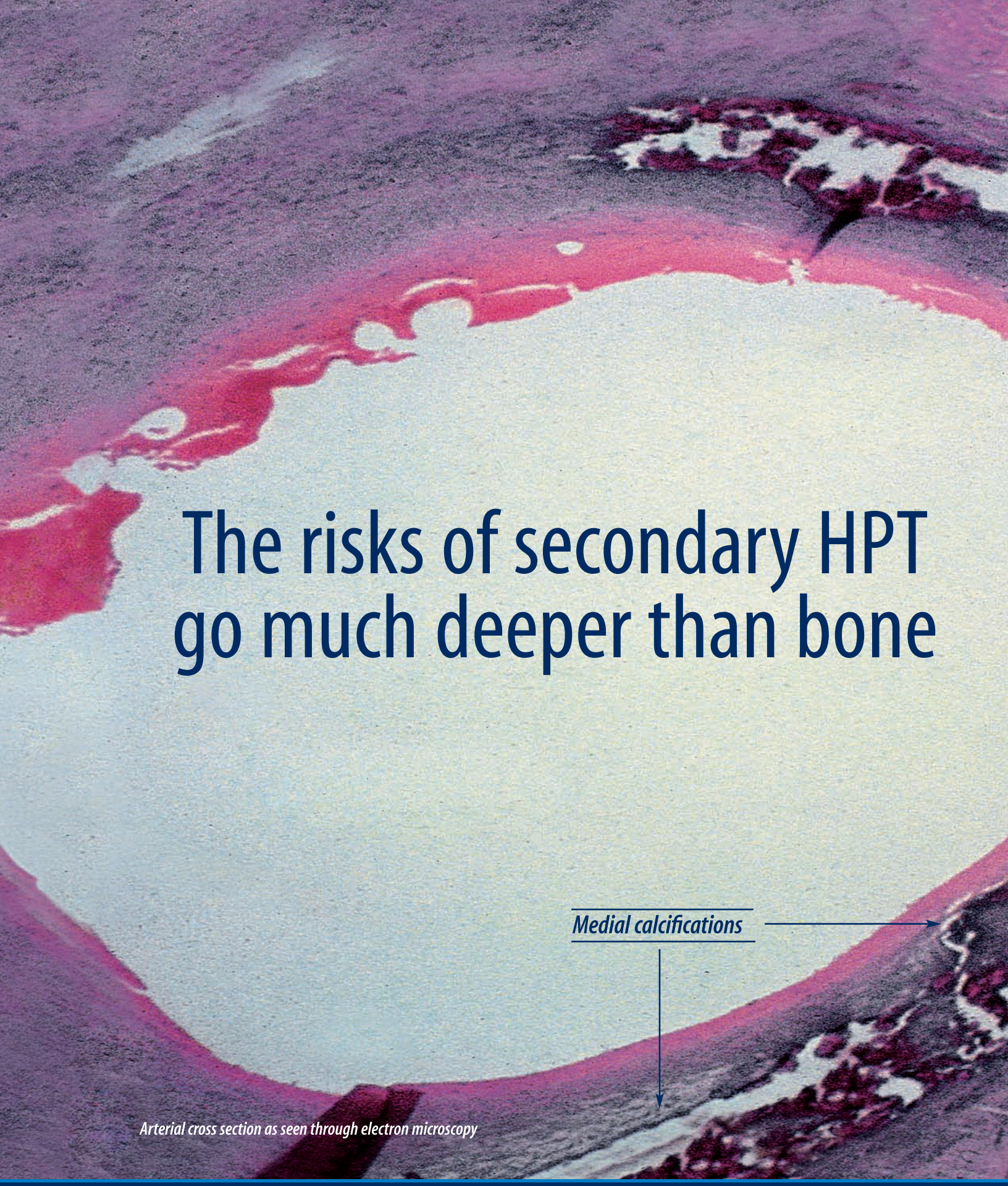
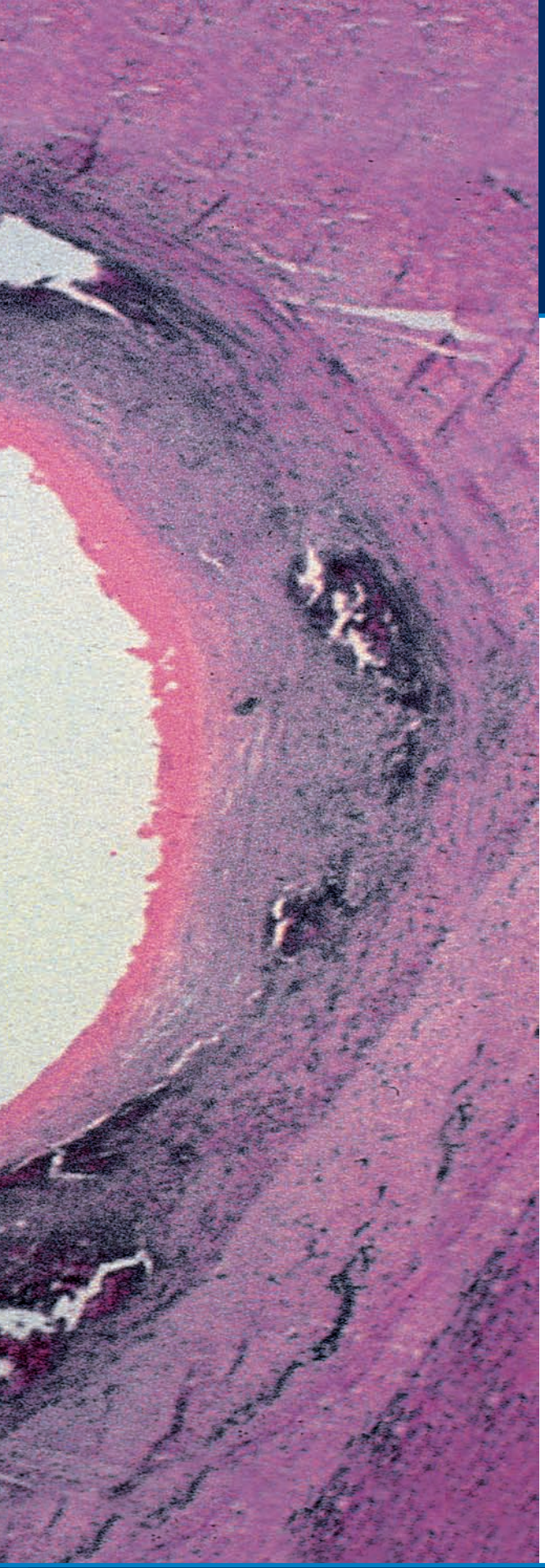


The risks of secondary HPT go much deeper than bone

Arterial cross section as seen through electron microscopy



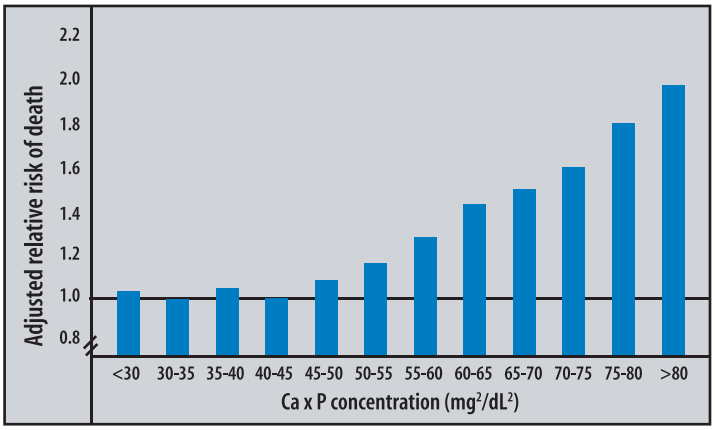
Failure to achieve NKF-K/DOQI™ bone metabolism goals* increases the risk of patient mortality[1-3]

Uncontrolled secondary HPT can be harmful for your patients on dialysis. In addition to bone disease and parathyroid gland hyperplasia, adverse outcomes include soft-tissue and cardiovascular calcification, increased hospitalizations, cardiovascular events, and increased mortality risk.[1,2,4] The majority of CKD patients on dialysis have metabolic parameters outside the K/DOQI™ goals despite use of traditional therapies.[5]

Only 17% of patients meet K/DOQI™ goals for both PTH and Ca x P, and only 8% meet all 4 goals[5,6]

A new analysis confirms that patients with PTH and Ca x P values outside the K/DOQI™ goal range are at significantly increased risk of mortality.[1] And the risk begins at relatively lower lab parameters: one retrospective study of over 40,000 patients showed that any Ca x P above 45 mg^2/dL^2 increased death and hospitalization rates.[1]

New analyses show the adverse consequences of uncontrolled secondary HPT[1]



Adapted from Block et al.[1]

This significant increase in risk caused by secondary HPT can be controlled. Through optimal clinical management of bone metabolism parameters, more patients can achieve the 4 key K/DOQI™ goals and patient outcomes can potentially be improved.[4]

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*NKF-K/DOQI™ Guidelines for Bone Metabolism and Disease in Chronic Kidney Disease.

MAKING SECONDARY HPT A PRIMARY FOCUS.

AMGEN®

KIDNEY FRIENDLY FACTS FOR PATIENT EDUCATION - FALL 2005

By Sharon Schatz, MS, RD, CSR, CDE. *Sharon is a renal dietitian with DaVita in Lumberton, N.J.. She can be reached at Srsmsrd@aol.com or sharon.schatz@davita.com.*

A challenging food issue for patients on dialysis is determining which soup is appropriate for them to choose to incorporate into their nutritional regimen. This is a complex subject for dialysis patients due to the limitations of the renal nutrition regimen regarding fluid, sodium and potassium. This column will provide nutrient composition of some low sodium soups and practical tips on making homemade soups.

Many patients are limited to 2000 mg of sodium per day and unfortunately lower sodium prepackaged soups are not plentiful on the market. Some reduced sodium soups contain as much as 400 mg per serving (1/2 c serving size). Campbell's® Healthy Request® Condensed Soups fall into this category. These soups can be incorporated into a patient's nutrition regime with planning and consideration of their individual fluid, sodium and potassium needs. Surprisingly, their tomato soup has only 250 mg potassium (K) per ½ cup, whereas the minestrone soup has 460 mg K. Campbell's also has soups marketed as "low sodium", however K analysis is not available for this line of soups. You can learn more about these items on their web site, www.campbellwellness.com/product-collection.asp, or call customer service, 1-856-342-4800.

Health Valley® promotes the fact that their soups have 50-60% less sodium than regular soups and also manufactures no added-salt organic soups. Potassium data was not available on their web site or through their customer service department. Therefore, more information may be required regarding their nutritional content prior to recommending them to dialysis patients. For more information visit www.healthvalley.com/products or call 1-800-434-4246.

What about low sodium bouillon? Wyler's® (now owned by Heinz) has a sodium free instant bouillon . Nutrient data information was obtained from customer service (1-888-337-2420) and includes the following per pack or teaspoon (yield 1 cup when mixed with water): 10 Calories, 2 gm carbohydrate, 0 sodium, 470 mg K (chicken), 510 mg K (beef). The product contains potassium chloride.

Hormel's customer service department (1-800-523-4635) provided nutrition information for 1 tsp Herb Ox® instant low sodium bouillon powder: (yield 1 cup when mixed with water): 10 Calories, 2 gm carbohydrate, 0 sodium, 460.9 mg K (chicken), 440.3 mg K (beef).

Would it be a better option to make soups from scratch? Recipe analysis can be complicated. Dietitians suggest that patients "dialyze" or "leach" vegetables to lower the potassium content. This technique needs to be taken into account when making homemade soup, as foods cooked in water to produce broth, will contribute to the total potassium content. Patients may not eat the broth, vegetables, and protein source in the same ratios. Some may eat more vegetables and use less broth to control fluid intake while others may not be as fond of the cooked vegetables or meat/poultry. Therefore, we need to be aware of the contributions of the sum parts to the whole.

Theoretically, the difference between the nutrient values for the uncooked or raw products minus that for the cooked product is what would be in the stock. The yield is another factor to be considered, as it varies depending on the stage of preparation. If the same quantity is used for both raw and cooked, there will be an underestimation of the amount in the liquid portion. The analysis per serving could be determined by adding the "leached" potassium from every item and dividing by the amount of broth to calculate what is in the fluid portion. The recipe could direct the person to use ½ cup broth with ½ cup vegetables and 2 ounces meat/poultry based upon the analyses. The vegetable estimate would be an average compendium based on data for the cooked yield of all items divided by the total cooked vegetable volume. No wonder patients find it confusing!

Recipe analysis for homemade soups is time consuming. Here are some practical tips that you can use with patients.

- Use frozen instead of fresh vegetables when making soup. Frozen vegetables have less potassium than fresh and will leach less potassium into the broth.

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Kidney Friendly Facts *continued from page 14*

- Items could be pre-cooked before being combined into the stock pot. The flavor might not be as rich but neither will the potassium. Use seasonings such as herbs, spices, vinegar, or even a pinch of salt.

- No added salt canned vegetables could be used. However, their texture may be mushier than using frozen vegetables or pre-cooking fresh ones.

- Reduced sodium soups with sodium could be diluted with water and have cooked rice or noodles and leftover cooked meat or chicken added for bulk.

The following web sites are helpful references:

http://www.ars.usda.gov/Services/docs.htm?docid=9447 - has PDF files for Food Composition Classics.

Included are:

1) Murphy EW, Criner PE, and Gray BC. Comparison of methods for determining retentions of nutrients in cooked foods. *Journal of Agriculture and Food Chemistry.* 1975; 23:1153.

2) USDA Circular 183, Factors for converting percentages of nitrogen in foods and feeds into percentages of protein

3) *Agricultural Handbook* No. 74, Energy Value of Foods

4) *Agriculture Handbook* No. 102, Food Yields Summarized by Different Stages of Preparation – a most valuable tool!

5) The Chemical Composition of American Food Materials which is Dr. Atwater's pioneering publication on the composition foods, *Bulletin No. 28* published in 1896.

   http://www.nal.usda.gov/fnic/foodcomp/Data/HG72/hg72.html - download Nutritive Value of Foods, Home and Garden Bulletin 72 (HG-72). Table 2 is Tips for Estimating Amount of Food Consumed. Table 3 has the Yield of Cooked Meat per Pound of Raw Meat as Purchased.

www.fao.org/infoods/index_en.stm - food composition information for the International Network of Food Data Systems

www.cahe.nmsu.edu/pubs/_e/ - food and nutrition publication listings for the College of Agriculture and Home Economics, New Mexico State University. Check out Guide E-32, In a Pinch Food Yields and Guide E-131, In a Pinch Ingredient Substitution

http://culinaryarts.smccme.edu/ - Southern Maine Community College Culinary Arts home page. Go to Recipes for Ingredient Substitutions, Weight to Volume Conversions, and Food Yields. Go to Web Links for an extensive potpourri of sites related to cooking and food

http://www.oznet.ksu.edu/library/fntr2 - Kansas State Research and Extension Food Science and Human Nutrition Library. L730 Ingredient Substitutions and Food Yields.

All of the websites above were accessed on January 18, 2006

STIPEND REPORT: WHAT ABOUT MY GENERATION!

By Roxanne Poole, RD. *Roxanne is a renal dietitian for DaVita, Inc. in the North Orangeburg, S.C. and South Orangeburg, S.C. clinics and the newly appointed DaVita Area Dietician for South Carolina. She can be reached at jpoole@InfoAve.net.*

The following is a summary of a presentation by Marsha Diamond, MA, RD, and Jaime Schwartz, MS, RD, which took place at the American Dietetic Association Food & Nutrition Conference and Expo, St. Louis, Missouri, on October 23, 2005.

There are four American generations in the workplace and each has a unique generational profile of values formed by the historic events that occurred and experiences that they shared while growing up. No one person exactly fits a generation profile, but they do share many common tastes and attitudes affected by the personality of their generation. Understanding the generational differences in work ethics, perspective on work, and styles of group management, can help us find ways to be more successful in working with each other.

The four generations that are currently in the workplace include veterans, the baby boom generation, and generations X and Y. Veterans were born before 1940 and encompass 5% of today's workforce. Their core values include: dedication, sacrifice, hard work, conformity, law and order, respect for authority, patience, delayed reward, duty before pleasure, and adherence to rules.

The Baby Boom Generation includes people who were born from 1940 through 1960 (actual dates available for boom in births are 1946 through 1964). They make up 45% of today's workforce. Their core values include: optimism, team orientation, personal gratification, health and wellness, personal growth, youth, work, and involvement. Boomers reverted to the 60-plus hour work week, are passionate about bringing to work the concepts of heart and humanity, participation and spirit, and making a fair playing field for all.

The people who make up Generation X were born between 1960 through 1980. They are about 40 % of today's workforce. Their core values include: diversity, global-oriented thinking, balance, technological literacy, fun, informality, self-reliance, and pragmatism. Generation X works to live, unlike the Boomers who live to work. Generation X is adept at and comfortable with change. They are also resourceful, sometimes edgy, and need feedback and flexibility, with a strong aversion to micro-management.

Generation Y, also called Millenials /Nexters are people who were born between 1980 through 2000. They compose about 10% of the workforce. Information on the group's workforce is still limited, but their core values are optimism, civic duty, confidence, achievement, sociability, morality, street smarts, and diversity. This generation has a strong goal-oriented focus with deep technical knowledge. They have more open attitudes toward gender and ethnicity.

Understanding these generational profiles can help make working relationships more effective. Nine guidelines to building harmony in the workplace include:

1. Ensure open lines of communication between employees and all colleagues.

2. Explicitly specify expectations of the employee and advancement opportunity.

3. Have a job and reward menu that involves some core values of each generation.

4. Hiring process, orientation, and training programs need to involve a variety of specific learning styles as each generation learns differently.

5. Allow people to develop fully in their positions and de-emphasize career ladders.

6. Challenge the learning of each generation which includes mentoring, helping with social skills, setting goals, and rewarding in shorter time frame.

7. Create and retain an atmosphere where people feel like they make a difference, and are part of a team.

Continued on page 17

8. Include in the work environment the **ACORN** philosophy, from Generations at Work by Ron Zemke, Claire Raines, and Bob Filipczak, AMACOM, 2000. This philosophy says to: **A**ccommodate employee differences, **C**reate workplace choices, **O**perate from a sophisticated management style balancing concern for task and people and including trust and good communication, **R**espect competence and initiative, **N**ourish retention.

9. Incorporate philosophy from a poem "Please Understand Me" adapted from Please Understand Me by David Keirsey and Marilyn Bates, Prometheus Nemesis Books, 1978.

   "If I don't want what you want, please try not to tell me my want is wrong…

   I do not, for the moment at least, ask you to understand me.

   That will come only when you are willing to give up changing me into a carbon copy of you…

   To put up with me is the first step to understanding me.

   Not that you embrace my ways as right for you,

   But that you are no longer irritated or disappointed with me for my seeming waywardness.

   Then, in understanding me, you might come to prize my differences,

   And instead of trying to change me,

   Preserve and even nurture those differences."

Understanding that we interact with people from different generations who hold different core values can help us work more effectively with each other. Identifying, respecting, and tapping into generational differences, can strengthen a workplace team and spark creativity and opportunity for all employees.

Member Issues...

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RPG CHAIR MESSAGE

Cathi J. Martin, RD, CSR, LDN
cathim@bellsouth.net

I would like to welcome all new members to RPG as well as all returning members! It was great to see all of you who attended FNCE in October. For those of you who were able to attend, I'm sure you'll agree that RPG had quite a presence at FNCE beginning with our RPG Breakfast and the presentation of the Outstanding Service Award to Judith Beto, PhD, RD, FADA. Judith had an opportunity to speak to the group on "Maximizing Your High Biological Value", which was an inspiration to all.

RPG was also instrumental in bringing two clinical presentations to the meeting. Karla Giles, MS, RD presented "Managing Stage 5 CKD, Cardiac Calcification and PTH" at a dinner program for RPG members. At a FNCE Priority Session, Dr. Kevin Martin, from St. Louis University and Catherine Goedekke – Merickel, MS, RD spoke on the role of Vitamin D in Chronic Kidney Disease. Finally, the DPG Showcase offered many opportunities to network and see new materials, including the debut of the Spanish simplified renal diet. My thanks go to Abbott Laboratories, Nabi Biopharmaceuticals, and Genzyme for their generous support of RPG at FNCE this year.

Looking ahead, a workgroup has been formed to draft Scope of Practice and Standards of Professional Performance for Chronic Kidney Disease. This is a relatively new initiative of the American Dietetic Association and we are very excited to be involved. This is a joint project between RPG and the Council on Renal Nutrition of the National Kidney Foundation. The chairs for the workgroup include myself, Deborah Brommage, MS, RD, Chair of CRN and Maria Karalis, MBA, RD. Representatives from RPG include Jessie Pavlinac, MS, RD, Cathy Goeddeke-Merickel MS, RD, LD, Laura Byham-Gray, PhD, RD, CNSD and Jennie House, RD, LD. Representatives from CRN include Linda McCann, RD, CSR, LD, Maureen McCarthy, MPH, RD, Karen Wiesen, MS, RD and Debbie Benner, MA, RD. The project is expected to be accomplished within a year and will be published in the Journal of the American Dietetic Association upon completion.

RPG is seeking enthusiastic and interested members that would like to be involved at the Executive Committee level. If you are interested, please send an email to Susan Knapp, MS, RD, Chair of the Nominating Committee at sknapp@intcon.net.

Judith Beto, Ph.D, RD, FADA (right) receiving the Outstanding Service Award from Cathi Martin, RD, CSR, LDN, Renal Practice Group Chair (left) at FNCE in October 2005.

OUTSTANDING SERVICE AWARD

Congratulations to Judith Beto, Ph.D., RD, FADA, 2005 recipient of the Outstanding Service Award

The Outstanding Service Award recognizes a RPG Member who has demonstrated leadership of and service to the profession of renal nutrition and RPG. This individual has shown initiative, dedication, and worked to advance the profession of renal nutrition. In addition, the individual has worked to optimize the nutritional status, care and well being of patients with chronic kidney disease. There is a patient-centered commitment in addition to the short and long-term goals for advancement of the profession.

RPG at FNCE 2005

Sarah Carter, RD, CDE, RPG Managing Editor (left) and Pat Weber, MS, RD, CSR, CDE, LDN, RPG Chair-Elect (right) at the DPG Showcase at FNCE 2005.

Cathy Goedekke-Merickel, MS, RD, RPG Secretary and RNF Assistant Editor (left) and Kevin Martin MB, B.CH., FACP (right) from St. Louis University after speaking on the role of vitamin D in CKD at a FNCE priority session.

Kidney Transplant Initiatives

Deborah Brommage

There are approximately 150,000 individuals that have kidney transplants, and more than 61,000 waiting for kidney transplant. In the event of multiple transplants, not only is it more difficult to find a good match but the risks of mortality increase. In order to extend the life of an organ and have fewer second or third transplants, better clinical management is vital.

Currently renal transplant recipients do not receive adequate follow-up care. Renal transplant recipients face numerous post transplant complications including post-transplant diabetes, hypertension, infections, fractures and malignancies; which result in increased morbidity and mortality. The unique medical needs of this patient population have precipitated the need for specialized care. Two noteworthy initiatives regarding kidney transplant are in progress that address this need.

Making Lives Better Campaign II

The National Kidney Foundation Making Lives Better (MLB) Campaign II is a national fundraising effort sponsored by the NKF National Board of Directors to obtain support for the development of the Guideline on Transplantation. The objective of this clinical practice guideline is to improve the care and outcomes of kidney transplant recipients as follows:

- Enable better long term clinical management of kidney transplant recipients
- Address and treat the complications which increase morbidity and cost in transplantation
- Reduce the number of repeat transplants
- Reduce the number of post transplant complications that may result in death

Although the holiday season is behind us, the spirit of the season and giving can still be present. I hope many of you will consider making a gift to the National Kidney Foundation and play a significant role in “making lives better” for transplant recipients. For more information on any aspect of support for the NKF MLB Campaign II, contact me at 516-663-9028 or dbrommage@winthrop.org.

Medicare Proposed Rule

The Centers for Medicare and Medicaid Services (CMS) published Proposed Changes to the Hospital Conditions of Participation: Requirements for Approval and Re-approval of Transplant Centers to Perform Organ Transplants, on February 4, 2005. (1) The focus of these proposed requirements is on an organ transplant center’s ability to perform successful transplants and deliver quality patient care as evidenced by good outcomes and sound policies and procedures.

The proposed rule includes provisions for transplant centers to utilize a qualified dietitian who will assess the nutritional and dietetic needs of each patient, recommend therapeutic diets, provide diet counseling to patients and their families, and monitor adherence and response to a prescribed diet. CMS supports that all transplant patients and living donors may need dietary modifications, permanently or temporarily, to maintain balances in fluids, electrolytes, and macro or micro-nutrients.

ADA and NKF support the CMS position on nutrition assessments and diet counseling and have recommended that the minimum qualifications for ‘qualified dietitian’ include dietetic registration as specified in standards established by the Commission on Dietetic Registration, and as already established and defined under Medicare Part B for outpatient MNT services.

The stipulation to make nutrition assessments and diet counseling services furnished by a qualified dietitian available to all transplant patients and living donors recognizes the benefits of medical nutrition therapy with regard to post transplant complications, potential food-medication interactions and overall patient outcomes. It also acknowledges the dietitian as an integral part of the transplant team.

Reference:

1. Federal Register Part III, Department of Health and Human Services Centers for Medicare & Medicaid Services, 42 CFR Parts 405,482, and 488.
2. Medicare Program; Hospital Conditions of Participation: Requirements for Approval and Re-Approval of Transplant Centers To Perform Organ Transplants: Proposed Rule. February 4, 2005. pp. 6140-6182

Title/Description	*Price*
Eating Simply with Renal Disease: (25 per pkg) Simple overview of the renal nutrition plan for patients with CKD Stage 5	$15.50 per pkg
Eating Simply with Renal Disease: (25 per pkg) Spanish version of the renal nutrition plan overview for patients with CKD Stage 5	$15.50 per pkg
Bone Store Kit: Patient education module focusing on calcium and phosphorus to improve mineral metabolism imbalances	$10.00 each
Dietitian's Manual: Camera-ready, single-page patient education compiled from previous Renal Nutrition Forum Issues	$10.00 each

Please Note:
Shipping and Handling Fees:
1 – 3 items: $5.00
4 – 13 items: $10.00
(pkg of 25 = 1 item)

To order materials:
Please download order form from RPG website at www.renalnutrition.org under Member Resources.
Make checks payable to: Renal Practice Group/ADA

Mail form and check to:
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114 Infantry Road, Vermillion, OH 44089

For additional information:
Please contact Pat Williams at gwilliepat@aol.com

2005-2006 RPG Executive Committee

Mission: Renal dietitians dietetic practice group is leading the future of dietetics by promoting and supporting ADA members working in nephrology practice.
Vision: RPG members are a valued source of expertise in nephrology nutrition.

OFFICERS:

Chair
Cathi Martin, RD, CSR, LDN
7076 Bridgeport Drive
Nashville, TN 37221
615/384-8939
Fax: 615/384-1949
cjmartin@renalcaregroup.com

Immediate Past Chair
Jenny Smothers, RD, LD
5209 Wood Lake Cove
Tupelo, MS 38801
662/844-0009
Fax: 662/690-9200
jensmothers@comcast.net

Chair-Elect
Patricia Weber, MS, RD, CSR, CDE, LDN
50 Meadow Brook Rd
Springville, AL 35146
205/467-2533
webermsrd@gmail.com

Secretary
Catherine M. Goeddeke-Merickel, MS, RD, LD
9386 Magnolia Way North
Maple Grove, MN 55369
612/834-4474
cmgmerickel@comcast.net

Treasurer
Pamela Kent, MS, RD, CSR, LD
114 Infantry Rd
Vermilion OH 44089
216/368-0004
pamela.kent@genzyme.com

EDITORIAL STAFF:

Advertising Editor
Marianne Hutton, RD, CDE
2355 Morningside Circle
Santa Rosa, CA 95405
707/575-0974
Fax: 707/575-0974
finelyfit2005@yahoo.com

Managing Editor
Sarah Carter, RD, CDE
126 Meadowbrook Lane
Tullahoma, TN 37388
931/455-2803
sarahc1966@yahoo.com

Editor
Sharon Griff, MBA, MS, RD
2020 St. Johns Avenue, #210
Highland Park, IL 60035
847/847-6729
rnfeditor@yahoo.com

Assistant Editor and Web Editor
Catherine M. Goeddeke-Merickel, MS, RD, LD
9386 Magnolia Way North
Maple Grove, MN 55369
612/834-4474
cmgmerickel@comcast.net

ADA Practice Team Manager
Susan DuPraw, MPH, RD
120 South Riverside Plaza, Suite 2000
Chicago, IL 60606-6995
800/877-1600 ext. 4814
Fax: 312/899-4812
sdupraw@eatright.org

Professional Issues Delegate
Mary Russell, MS, RD, LDN, CNSD
7 Silverton Court
Durham, NC 27713-9400
919/684-1994
Fax: 919/681-9575
maryrussell@duke.edu

COMMITTEES:

Membership Chair
Connie B. Cranford, MS, RD, LDN
Gambro Healthcare, Springfield Central
932 N. Rutledge
Springfield, IL 62702
217/788-3849
Fax: 217/788-5500
connie.cranford@davita.com

Nominating Committee:
Chair:
Susan Knapp, MS, RD, CSR, LD
125 West Charlotte Street
Broken Arrow, OK 74011-4344
susan.knapp@davita.com

Member:
Paula Frost, RD, CSR, LD
Lee Street Dialysis
5155 Lee Street NE
Washington, DC 20019
PH: 202/398-1047
paula.frost@davita.com

Member:
Kathleen M. Madigan, MS, RD, LDN, CSR, MBA
Upland Dialysis
One Medical Center Blvd; POB II, Suite 120
Upland, PA 19013
PH: 610-447-2825
kathleen.madigan@davita.com

AREA COORDINATORS/COMMITTEE CHAIRS:

Area I/ CQI-Outcomes Chair
Chhaya Patel, MA, RD, CSR
757 Snowdon Court
Walnut Creek, CA 94598
PH: 952-937-0203
chhaya.patel@davita.com

Area II/ Awards and Scholarships
Mary Jo Dahms, RD, LD, CD
DaVita Dialysis
2785 White Bear Avenue
Suite 201
Maplewood, MN 55109
651/777-8839
MaryJo.Dahms@DaVita.com

Area III/ Education Chair
Patricia Williams, RD, LDN
Renal Care Group
1120 Lakeview Drive
Suite 400
Franklin, TN 37067
615/599-9810
gwilliepat@aol.com

Area IV/ Lending Librarian (Western U.S.)
Jennie House, RD, CSR, LD
Permian Basin Dialysis Center
4200 West Illinois, #140
Midland, TX 79703
915/522-2300
jennie.house@fmc-na.com

Area V/Lending Librarian (Eastern U.S.)
Lisa Anderson, RD, CD
4270 Ellington Court
Spencer, IN 47460
812/876-1805
Landerson@bloomhealth.org

Area VI/ Legislative Chair
Karen Basinger, MS, RD, LD
DaVita - Wheaton
11941 Georgia Avenue
Wheaton, MD 20902
301/949-9620
kbase1@comcast.net

Area VII/ Historian Chair
Patricia Barba, MS, RD, LDN
3 Countryside Drive
Lincoln, RI 02865
401/728-5006
patricia.barba@davita.com

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Sharon Griff, MBA, MS, RD
Editor, *Renal Nutrition Forum*
2020 St. Johns Ave., #210
Highland Park, IL 60035

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