



## NUTRITIONAL DEFICIENCIES

### WATER SOLUBLE VITAMINS AND ZINC

Water soluble vitamins are dialysable; the three vitamins dialysis patients are most likely to be deficient in are: ascorbic acid (vitamin C), folic acid, and pyridoxine (vitamin B<sub>6</sub>).

#### Ascorbic Acid

- is an important factor in oxidation reduction reactions, generation of dehydrofolate, the active moiety of folic acid, and has an influence on iron absorption. Excess ascorbic acid may cause retention of oxalates as calcium oxalate. High plasma oxalate levels have potential for deposition in soft tissues leading to muscle pathology (kidney, heart and thyroid gland).
- has been demonstrated to increase iron utilization in anemia

#### Folic Acid

- may be low due to inadequate intake, losses during dialysis or inadequate absorption; the prevention of anemia is a major therapeutic goal in dialysis patients. It is important to maintain adequate plasma and body stores of this vitamin. (See anemia section)

#### Hyperhomocysteinemia

- goal is < 10 umol/L for men and women  
treat if > 15.5 umol/L for men; >12.5 umol/L for women
- homocysteine is an independent risk factor for premature (atherothrombotic) cardiovascular disease (independent of hypercholesterolemia, HTN, smoking)
- significant homocysteine metabolism occurs in the kidneys normally (70%)
- reduced active kidney mass increases plasma serum levels of homocysteine
- plasma folic acid, B12 and B6 (pyridoxine) are cofactors for homocysteine
- increase in plasma homocysteine → early arteriosclerosis, arterial and venous thrombosis
- folate supplementation → decrease in serum homocysteine despite normal range basal serum folate and B12 and B6
- hyperhomocysteinemia progresses parallel with decline in renal function
- dialysis causes only a modest decrease in homocysteine since homocysteine is highly protein bound.

#### Pyridoxine

- pyridoxine deficiency may be associated with uremic symptomatology, delayed hypersensitivity reactions, impaired immunological function, and deranged protein and lipid metabolism.

- Zinc -
- status may be compromised due to 1) removal during hemodialysis 2) binding to calcium , preventing its absorption and 3) poor dietary intake (e.g. meat). Zinc deficiency may result in impaired taste acuity and poor appetite, hair loss, poor wound healing and impaired immune function. Administer only if symptoms of zinc deficiency present (i.e. impaired taste acuity or delayed wound healing). Usually see response by 3-4 weeks. Give 4-8 weeks trial, then reassess.

### **Management:**

- 1a) Replace Vitamins B and C and folic acid daily  
(recommended daily doses for end-stage renal failure patients: vitamin B<sub>6</sub> 10mg, vitamin C 60mg, folic acid 0.8-1mg)  
  
e.g. Diavite® (contains: vitamins B (B<sub>1</sub> 1.5mg, B<sub>2</sub> 1.7mg, niacinamide 20mg, pantothenic acid 10mg, pyridoxine 10mg, B<sub>12</sub> 6mcg), vitamin C 100mg, plus folic acid 1 mg
    - caution with doses of vitamin C > 100 mg.
  - 1b) Supplemental folic acid doses of 2-15 mg/day are recommended for hyperhomocysteinemia in addition to diavite.
  - 1c) May also add pyridoxine ~ 100 mg po daily and cyanocobalamin 500-1000 mcg po daily for hyperhomocysteinemia
- 2) Add zinc sulfate 50mg elemental 3 times weekly after dialysis or zinc gluconate 10-20 mg elemental zinc daily if symptoms of zinc deficiency are present (recommended daily dose for end-stage renal failure patients: zinc 15mg)

### **FAT SOLUBLE VITAMINS**

Do not use multiple vitamin preparations containing vitamins A and D.

Vitamin A: Dialysis patients tend to have large stores of vitamin A  
Hypervitaminosis of A has been associated with increased bone resorption in uremic patients (osteodystrophy), anemia and hypercalcemia

Vitamin D: not active as kidney cannot convert (hydroxylate) to active form (refer to mineral metabolism section)

Vitamin E: generally is elevated in unsupplemented dialysis patients

Vitamin K: appears adequate in dialysis diet and does not need to be supplemented

## **APPETITE STIMULANTS**

Malnutrition accounts for significant morbidity and mortality in dialysis patients. Moderate to severe malnutrition is found in up to 30% of dialysis patients. Improving nutrition through optimizing the duration and efficiency of dialysis, and increasing oral intake with supplementation of enteral products is not always effective. Intradialytic total parenteral nutrition (TPN during hemodialysis runs only) is a parenteral modality which is expensive and not available to all hemodialysis centres.

### **Drug Treatment**

#### **Megestrol acetate (Megace)**

- progesterone derivative with appetite stimulating properties
- HPB approved for cancer- or AIDS-related cachexia, anorexia or weight loss
- is currently being studied in dialysis patients as an appetite stimulant (dose = 800mg daily x 3 months in the study)
- also improved quality of life indicators (sense of well being)

#### **Amount and Type of Weight Gained**

- average 2-5 kg weight gain within 1-3 months of initiation of therapy
- most reports show increase in fat content +/- total body water
  - 2 trials (one in AIDS, one pilot study in dialysis) show increase in lean body mass

Dose: 160-800mg daily (can be given in one daily dose)

#### **Side Effects:**

- sexual dysfunction (4-26%, decreased libido and sexual thoughts)
- deep vein thrombosis (< 5%)
- withdrawal menses (1-2 weeks after discontinuation of drug) or breakthrough bleeding during the first 3 months of use
- hyperglycemia - may aggravate diabetes and increase insulin requirements (usually observed within first 3 months of therapy)
- gastrointestinal complaints (nausea, vomiting, diarrhea, flatulence)
- excess weight gain (> 10 kg)

Contraindications: thromboembolic disease

## Nutritional Deficiencies: Useful References

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