Nutritional Considerations of the Geriatric Patient

Dr. Ron Grabowski
November, 2011
Dr. Ron Grabowski is a practicing Doctor of Chiropractic in Houston, Texas. He has presented over 500 seminars and lectures on nutrition throughout the United States and in Europe, publishing several articles and a textbook in clinical nutrition.

Receiving his Bachelor of Science degree in Nutrition from North Dakota State University, he went on to be awarded his Doctor of Chiropractic degree from Texas Chiropractic College in Pasadena, Texas in 1989 where he became a professor and postgraduate diplomate lecturer. His dietitian experience includes tenure at some of the leading hospitals in the nation - The New York Hospital, Memorial Sloan Kettering in New York City (affiliated with Cornell Medical Center), Memorial Care System and the University of Texas M.D. Anderson Cancer Center in Houston, Texas.

Dr. Grabowski has served on the State of Texas Governor’s Childhood Obesity Taskforce and is a member of the American Dietetic Association, American Chiropractic Association and the Endocrine Society. In addition to his chiropractic practice, he has developed numerous vitamin and mineral formulas for supplement companies. Professional athletes, including those of Olympic standing, seek his expertise in nutrition consultation.

His research interests include nutritional support of the athlete and the use of supplements in clinical practice for the prevention and treatment of chronic diseases such as diabetes, heart disease, arthritis, fibromyalgia and gastrointestinal disorders.
Nutritional Considerations with the Geriatric Patient
Is there a Connection?

Nutritional Deficiencies

Pathologies  Medications
The 10 leading causes of death (2007 statistics) rank order:

- Diseases of heart
- Malignant neoplasms
- Cerebrovascular diseases
- Chronic lower respiratory diseases
- Accidents (unintentional injuries)
- Alzheimer's disease
- Diabetes mellitus
- Influenza and pneumonia
- Nephritis; nephrotic syndrome and nephrosis;
- Septicemia

Drug sales in the United States grew by 5.1% in 2009, reaching $300.3 billion.
Prescribed Drug Sales in United States

- Lipid regulators were the most commonly prescribed medications, growing by 4% to an estimated 211 million prescriptions.
- The third highest class in sales in 2009—proton pump inhibitors—experienced a 5% increase in prescriptions dispensed.
- Antidepressants were ranked fourth in total sales, growing by 4%.
- Antipsychotics were the highest grossing class of medications, with sales of $14.6 billion, followed by lipid regulators, which dropped 1% to $14.3 billion.
Hypertension

- More than 50% of all persons older than 65 years have hypertension.
- Improved control of HTN has contributed to reductions of nearly 60% in stoke-related deaths and 53% in deaths from ischemic heart disease.
Hypertension

- Hypertension is the most common condition for which Americans take prescription medication.
- In United States, only 70% of patients with HTN are aware of their condition.
- 59% are receiving treatment.
- Only 34% have achieved adequate control.
# Joint National Committee on Prevention

Blood Pressure Stages | Treatment Strategies
--- | ---
Prehypertension (120 to 139/80 to 89 mm Hg) | Lifestyle modification *
| Drug therapy in patients with DM or chronic kidney disease
Stage 1 (140 to 159/90 to 99 mm Hg) | Consider coexisting conditions
| Thiazide-type diuretics for most patients
Stage 2 (≥ 160 / ≥100 mm Hg) | Consider coexisting conditions
| Two-drug combination for most patients

*Lifestyle includes diet, exercise & weight reduction*
Thiazide Diuretics

- Thiazides can cause magnesium depletion, which may exaggerate renal potassium wasting and hypokalemia.
- Thiazide diuretics and angiotensin-converting enzyme inhibitors can cause excessive urinary zinc (Zn) loss and Zn depletion.
- Magnesium (Mg) deficiency has shown to exacerbate hypertension.

Am J Hypertens. 2005 May
Am J Ther. 2006 Mar-Apr
Magnesium and Aging

- Chronic inflammation and oxidative stress have both been identified as pathogenic factors in aging and in several age-related diseases.
- Chronic Mg deficiency results in excessive production of oxygen-derived free radicals and low grade inflammation.
- Mg also acts as an antioxidant against free radical damage of the mitochondria.
- Aging is very often associated with Mg inadequacy and with increased incidence of many chronic diseases such as muscle loss and sarcopenia, altered immune responses, and vascular and metabolic conditions; atherosclerosis, diabetes and the cardiometabolic syndrome.

Curr Pharm Des. 2010
Hypertension and Diabetes

- Hypertension (HTN) is ~ 2x as high in Type 2 Diabetes mellitus.
- Most patients with diabetes and HTN require two or more medications to control HTN.
- One of the two medications should be an ACE inhibitor.
Magnesium and Diabetes Mellitus

• It has been revealed that low serum magnesium (Mg) is often associated with insulin resistance (IR), cardiovascular problems, diabetes mellitus, and hypertension.

Gynecol Endocrinol. 2011
Coronary Artery Disease and CoQ10

- Coronary artery disease (CAD) is associated with endothelial dysfunction and mitochondrial dysfunction (MD).
- In patients with ischaemic left ventricular systolic dysfunction (LVSD), 8 weeks supplement of CoQ10 improved mitochondrial function and flow-mediated dilation (FMD); and the improvement of FMD correlated with the change in mitochondrial function.

Carnitine and Lp(a)

- The coadministration of carnitine and simvastatin resulted in a significant reduction in Lp(a) and Apo(a) and may represent a new therapeutic option in reducing plasma Lp(a) levels, LDL cholesterol and Apo B100.

Expert Opin Pharmacother. 2009 Aug
Clin Ther. 2003 May
Carnitine and CoQ10

- One study showed that supplementation with carnitine and coenzyme Q10 could reduce serum levels of lipoprotein(a) in maintenance hemodialysis patients treated with statins.

Iran J Kidney Dis. 2011
Nutritional inadequacies in patients with stable heart failure.

- Two 3-day food records were completed by 123 patients with heart failure and 58 controls.
- Prevalence of inadequate potassium intake was 94% among patients with heart failure and 91% among controls.
- More than 50% in each group had inadequate intakes of calcium, magnesium, folate, and vitamins D and E.

JADA 2009 Nov
Homocysteine and Cardiovascular Disease

• Elevated blood homocysteine is a risk factor for cardiovascular disease.
• A 5-µmol/L increase is associated with a 70% increase in relative risk of cardiovascular disease in adults.
• For patients with established risk factors, this risk has shown to be even greater.

AJCN-11/1999
Osteoporosis

We must consider all of the pieces to this puzzling pathology!
Osteoporosis

- Worldwide, an osteoporotic fracture is estimated to occur every 3 seconds, a vertebral fracture every 22 seconds.
- Nearly 75% of hip, spine and distal forearm fractures occur among patients 65 years old or over.
- A 10% loss of bone mass in the vertebrae can double the risk of vertebral fractures, and similarly, a 10% loss of bone mass in the hip can result in a 2.5 times greater risk of hip fracture.
- By 2050, the worldwide incidence of hip fracture in men is projected to increase by 310% and 240% in women.
- The combined lifetime risk for hip, forearm and vertebral fractures coming to clinical attention is around 40%, equivalent to the risk for cardiovascular disease.
- In Caucasian women, the lifetime risk of hip fracture is 1 in 6, compared with a 1 in 9 risk of a diagnosis of breast cancer.

Osteoporos Int 9:29.
J Bone Miner Res 15:721.
Osteoporos Int 7:407.
Lancet 359:1761.
Treatment Guidelines for Osteoporosis (Medical Model)

- **Overall Strategies**
  - Calcium supplements, with or without vitamin D supplements, or calcium-rich diet.
  - Weight-bearing exercise
  - Avoidance of alcohol, tobacco products, drugs and excessive caffeine
  - ERT within five years of menopause for 10+ years
  - Alendronate (Fosamax)
  - Raloxifene (Evista)
Vitamin D

- Vitamin D deficiency is now recognized as a pandemic.
- Vitamin D deficiency has been associated with increased risk of osteopenia/osteoporosis, common cancers, autoimmune diseases, hypertension, Diabetes mellitus and infectious diseases.
- A circulating level of 25-hydroxyvitamin D of >75 nmol/L, or 30 ng/mL, is required to maximize vitamin D's beneficial effects for health. In the absence of adequate sun exposure, at least 800–1000 IU vitamin D₃/d may be needed to achieve this in children and adults.
Zinc and Osteoporosis

- Collagen synthesis and mineralization of bone.
- Synthesis of alkaline phosphatase.
- Augments the anabolic effect of insulin-like growth factor I on osteoblasts.

J Nutr (1982)
Peptides (1995)
Vitamin K

• Nutritional vitamin K intake decreases substantially with age (Jie et al. 1995).
• Vitamin K is produced in the intestinal tract via the normal flora.
• Vitamin K levels can be decreased with antibiotic use.
• Two vitamin K-dependent proteins not involved in hemostasis are osteocalcin or bone Gla protein (BGP) and matrix Gla protein (MGP).
• Osteocalcin is a low-molecular-weight protein (49-50 residues, depending upon species) containing three Gla residues that give the protein its mineral-binding properties (Price 1988).
Vitamin K and Fractures

- Patients with hip fractures or spinal compression fractures were reported to have very low concentrations of circulating phylloquinone (Hart et al. 1984, Hart et al. 1985, Hodges et al. 1993) and menaquinone (Hodges et al. 1993).

- It has been shown that vitamin K supplementation increases the serum markers for bone formation (including osteocalcin and bone alkaline phosphatase) and may reduce urinary calcium and hydroxyproline excretion (Knapen et al. 1989, Knapen et al. 1993, Plantalech et al. 1990).
Homocysteine Relationship to Bone

- It has been proposed the role of lysyl-oxydase inhibition might interfere with collagen crosslink formation.
- Some studies suggest that there may be a dysregulation of the osteoprotegerin/receptor activator of nuclear factor-kappaB (RANK) ligand/RANK axis, others the involvement of oxidative stress.

J Endocrinol Invest. 2009
Parkinson’s Disease and Osteoporosis

• Parkinson's disease (PD) patients have been reported to have lower bone mineral density (BMD) and higher fracture risk than individuals without PD.
• Research findings indicate that hyperhomocysteinemia due to levodopa intake may be one additional risk factor for osteoporosis and fracture in PD patients.
• Reducing Hcy may be a therapeutic modality for treating osteoporosis in PD patients taking levodopa.

Calcif Tissue Int. 2010 Feb
Dementia & Homocysteine

Cumulative incidence of dementia (%)

Duration of follow-up (y)

> 15.0 μmol/L (n = 217)

12.6 - 15.0 μmol/L (n = 184)

10.1 - 12.5 μmol/L (n = 204)

< 10.1 μmol/L (n = 211)

AJCN-9/2005
Proton Pump Inhibitors and Nutrient Deficiencies

- Proton pump inhibitors (PPIs) may cause cyanocobalamin (vitamin B12) malabsorption, but measuring serum B12 alone may underestimate the prevalence. (Aliment Pharmacol Ther. 2008)

- Copper deficiency myelopathy (CDM) is an increasingly recognized mimic of subacute combined degeneration (SCD) of the cord due to cobalamin (vitamin B(12)) deficiency. (Med Hypotheses. 2008)
B12 and Cognitive Function

• The idea that low-normal concentrations of vitamin B-12 might be associated with cognitive impairment was raised by Bell et al in 1990 and clearly expressed by Rosenberg and Miller in their seminal review 2 years later, where they wrote:

  “For most people, including elderly people, overt vitamin deficiencies are unlikely; it is more likely that mild or ‘subclinical’ vitamin deficiencies may play a role in the pathogenesis of declining cognitive function in aging”.

Classical Vitamin B-12 deficiency

- Is associated with damage to the white matter in the spinal cord and in the brain, which has been attributed to damage to myelin as a result of deficient methylation of myelin basic protein (MBP).
- There is significant evidence that damage to the white matter in the brain is associated with, and may precede, cognitive decline.

B12 Diagnostics

• Assessment of vitamin B-12 status is not straightforward because total plasma vitamin B-12 concentrations are not a good marker for the status of the vitamin in the tissues.

Mechanisms proposed for the effects of homocysteine on the brain, apart from an effect on the cerebral vasculature.

- Alternatively, the effect of low vitamin B-12 status might be mediated by the raised concentrations of MMA, as discussed by McCracken et al; notably, the concentration of MMA in cerebrospinal fluid is twice that in plasma.
  

- Classical deficiency of vitamin B-12 is accompanied by alterations in the concentrations of cytokines, such as tumor necrosis factor-α or epidermal growth factor.
  

- It is not known whether these cytokines are changed in subjects with low-normal vitamin B-12 status.
B12 and Neurological Structures

- Changes associated with low-normal vitamin B-12 status might mediate the effect on cognition:
  - atrophy of the brain
  - damage to the white matter.
- Progressive loss of brain tissue (atrophy) is well established as a factor associated with, or causing, cognitive decline and dementia, and recently it was shown that low-normal vitamin B-12 status at baseline is a predictor of whole-brain atrophy in community-dwelling elderly.

Neurology 2008;71:826–32
Neurology 2008;70:828–33.
B12 Levels and Brain Atrophy

- Progressive atrophy of the brain was associated with plasma vitamin B-12 concentrations ranging from 800 to 160 pmol/L and with holotranscobalamin concentrations from 250 to 25 pmol/L.
- Subjects with plasma vitamin B-12 in the bottom tertile of plasma vitamin B-12 showed about twice the rate of atrophy (1.05%/y) as those in the other 2 tertiles (0.51%/y).

Neurology 2008;71:826–32.
S-adenosylmethionine

- The commonest hypothesis, however, for the neurotoxic effects of low vitamin B-12 status is that it leads to a deficiency of S-adenosylmethionine (SAM) and thereby to deficient methylation reactions in the central nervous system.  (Br Med Bull 1999;55:669–82).
- Low levels of SAM have been found in cerebrospinal fluid and in the brain of patients with Alzheimer's disease, but we are not aware of any studies of SAM in the brain in relation to low-normal vitamin B-12 status.

Alzheimer’s Statistics

• Approximately 5.4 million Americans have Alzheimer’s disease (AD). Unless a cure or prevention is found, that number will increase to between 11 and 16 million by 2050.
• Alzheimer's affects up to 13 percent of people 65 and over and increasing to 50 percent at 85 and older.
• Direct and indirect costs of AD and other dementias amount to more than $183 billion annually.
• Almost 15 million Americans are caring for a person with Alzheimer’s disease or another dementia.
• A new person develops Alzheimer's disease every 69 seconds -- this is projected to increase to every 33 seconds by 2050.
Nutrient Considerations with Alzheimer’s

• It has been hypothesized that a combination of multiple nutritional additives may be able to provide neuroprotection.
• We demonstrate herein that dietary supplementation with a mixture of ALA, ALCAR, GPC, DHA, and PS reduced reactive oxygen species in normal mice by 57% and prevented the increase in reactive oxygen species normally observed in mice.

Nutr Res. 2009 Jan
CoQ10 and Alzheimer’s

- Increased oxidative stress is implicated in the pathogenesis of Alzheimer's disease (AD).
- A large body of evidence suggests that mitochondrial dysfunction and increased reactive oxygen species occur prior to amyloid-β (Aβ) deposition.
- Coenzyme Q10 (CoQ10), a component of the mitochondrial electron transport chain, is well characterized as a neuroprotective antioxidant in animal models and human trials of Huntington's disease and Parkinson's disease, and reduces plaque burden in AβPP/PS1 mice.
  - Importantly, CoQ10-treated mice showed improved cognitive performance during Morris water maze testing.

J Alzheimers Dis. 2011
Acetyl-L Carnitine and Alzheimer’s

- Hyperhomocystinemia could induce tau protein hyperphosphorylation, β-amyloid (Aβ) accumulation, and memory deficits as seen in Alzheimer disease (AD), the most common cause of senile dementia with no effective cure currently.
- It was found that simultaneous supplement of ALC could improve the Hcy-induced memory deficits remarkably, with attenuation of tau hyperphosphorylation and Aβ accumulation.
- Supplement of ALC almost abolished the Hcy-induced tau hyperphosphorylation at multiple AD-related sites. Supplementation of ALC also suppressed the phosphorylation of β-amyloid precursor proteins (APP), which may underlie the reduction of Aβ.

Rejuvenation Res. 2011 Oct
J Neurochem 2011 Sep
Commonly asked questions

1. Will I receive a copy of the presentation slides?
   YES

2. Is the presentation being recorded?
   YES

**You will receive an email linking to both within the next 24 hours. It will also be available on our website at www.spectracell.com in our webinar library.**