

NUTRI NEWS



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Diabetes – A Nutrition Update

Vern Cherewatenko, M.D.

What is diabetes?

Diabetes is a group of diseases characterized by high levels of blood glucose resulting from defects in insulin production, insulin action, or both. Diabetes can be associated with serious complications and premature death, but people with diabetes can take steps to control the disease and lower the risk of complications.

Types of Diabetes

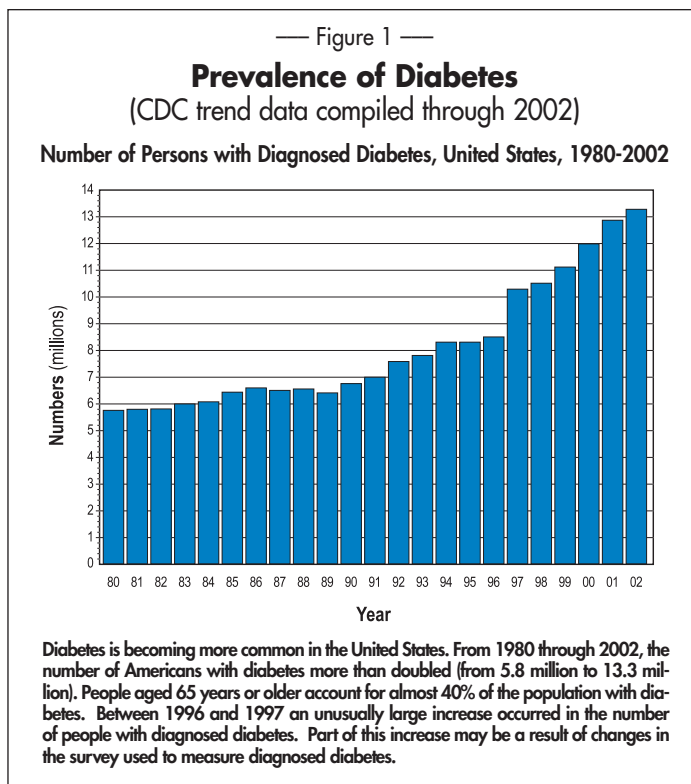
Type I diabetes was previously called insulin-dependent diabetes mellitus (IDDM) or juvenile-onset diabetes. Type I diabetes develops when the body's immune system destroys pancreatic beta cells, the only cells in the body that make the hormone insulin that regulates blood glucose. This form of diabetes usually strikes children and young adults, although disease onset can occur at any age. Type I diabetes may account for 5% to 10% of all diagnosed cases of diabetes. Risk factors for type I diabetes include autoimmune, genetic, and environmental factors.

Type II diabetes was previously called non-insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes. Type II diabetes may account for about 90% to 95% of all diagnosed cases of diabetes. It usually begins as insulin resistance, a disorder in which the cells do not use insulin properly. As the need for insulin rises, the pancreas gradually loses its ability to produce insulin. Type II diabetes is associated with older age, obesity, family history of diabetes, prior history of gestational diabetes, impaired glucose tolerance, physical inactivity, and race/ethnicity. African Americans, Hispanic/Latino Americans, Native Americans, and some Asian Americans, Native Hawaiian, or other Pacific Islanders are at particularly high risk for type II diabetes. Type II diabetes is increasingly being diagnosed in children and adolescents.

Gestational diabetes is a form of glucose intolerance that is diagnosed in some women during pregnancy. Gestational diabetes occurs more frequently among African Americans, Hispanic/Latino Americans, and Native Americans. It is also more common among obese women and women with a family history of diabetes. During pregnancy, gestational diabetes requires treatment to normalize maternal blood glucose levels to avoid complications in the infant.

After pregnancy, 5% to 10% of women with gestational diabetes are found to have type II diabetes. Women who have had gestational diabetes have a 20% to 50% chance of developing diabetes in the next 5-10 years.

Other specific types of diabetes result from specific genetic conditions (such as maturity-onset diabetes of youth), surgery, drugs, malnutrition, infections, and other illnesses. Such types of diabetes may account for 1% to 5% of all diagnosed cases of diabetes.



Continued on page 2

INSIDE THIS ISSUE

- Diabetes – A Nutrition Update**page 1
by Vern Cherewatenko, M.D.
- Diabetes – The Sleeping Giant Awakes**page 3
by James LaValle, R.Ph., N.D., C.C.N.
- Combat Metabolic Syndrome X**page 3
by Stephen Holt, M.D.
- Going Grey, Gaining Weight: The Road to Type 2 Diabetes** ...page 7
by Dr. Ronald Klatz and Dr. Bob Goldman

Prevention or Delay of Diabetes

Research studies in the United States and abroad have found that lifestyle changes can prevent or delay the onset of type II diabetes among high-risk adults. These studies included people with Impaired Glucose Tolerance (IGT) and other high-risk characteristics for developing diabetes. Lifestyle interventions included diet and moderate-intensity physical activity (such as walking for 2 1/2 hours each week). In the Diabetes Prevention Program, a large prevention study of people at high risk for diabetes, the development of diabetes was reduced 58% over three years.

Studies have also shown that medications have been successful in preventing diabetes in some population groups. In the Diabetes Prevention Program, people treated with the drug metformin reduced their risk of developing diabetes by 31% over three years. Treatment with metformin was most effective among younger, heavier people (those 25-40 years of age who were 50 to 80 pounds overweight) and less effective among older people and people who were not as overweight.

Similarly, in the STOP-NIDDM Trial, treatment of people with IGT with acarbose reduced the risk of developing diabetes by 25% over three years. Other medication studies are ongoing. In addition to preventing progression from IGT to diabetes, both lifestyle and medication have also been shown to increase the probability of reverting from IGT to normal glucose tolerance. There are no known methods to prevent type I diabetes. Several clinical trials are currently in progress, and being planned.

The Power of Patients Understanding the Physiology of the Problem.

The trend shows a marked increase in the last ten years. The multi-factorial etiology lends itself to a multi-modal treatment intervention. At its core, diabetes must be treated with sound nutritional intervention, targeted nutraceutical augmentation and an exercise program that is tolerated and perpetuated by the individual. I believe a direct approach with patients, spending a good deal of time discussing the physiology involved with diabetes is essential in partnering with them in their care. My patients are eager to learn the intricacies of metabolic syndrome, insulin resistance, glucose transport protein, Hemoglobin A1c measurements and other facets of the physiology involved with the disease. By explaining the biology that is occurring in their bodies, at a level they can understand, our patients have been much more compliant with dietary modifications, nutritional supplementation and increasing their effective exercise.

Targeted Formulations

Formulating products to promote natural therapeutic interventions that are well documented in the literature must be combined with a product manufacturer that only uses raw ingredients of the highest quality.

Garcinia cambogia (-)-hydroxycitric acid (HCA)

I have been impressed with the patient success and compliance with various HCA and HCA/Chromium based formulas for treating patients with glucose dysfunction and metabolic syndrome. *Garcinia* is an all-natural, safe and effective plant extract containing (-)-hydroxycitric acid (HCA), a clinically proven diet ingredient that helps suppress appetite and inhibit fat production, without stimulating the central nervous system. HCA is a competitive inhibitor of ATP citrate lyase responsible for the conversion of excess carbohydrate to triglycerides. Highly bioavailable sources of (-)-hydroxycitric acid (HCA), are reported to decrease body weight and have demonstrated safety in standard toxicity tests. In a recent study the effects of HCA on weight change and other variables in 60 moderately obese individuals were investigated. The subjects were randomly given 2,800 mg HCA daily, or combined with 400 mcg chromium polynicotinate plus 400 mg of *Gymnema sylvestre* extract or placebo. All three groups received a 2,000 Kcal diet and participated in supervised exercise. After only 8 weeks, both body weight and body mass index (BMI, an indicator of healthy body weight) decreased by 5% in the HCA treated group. A 15.9% reduction in appetite (as measured by unconsumed food) was also observed, while urinary fat metabolites (a marker of fat breakdown) rose significantly. The HCA group showed significant reductions in total cholesterol, LDL cholesterol, and triglycerides. Additionally, levels of beneficial HDL increased by 8%. The combination group experienced even greater results in all parameters tested, while only marginal or non-significant effects were observed in all parameters for the placebo group. These results parallel that which I observe in my clinical practice. HCA alone, and when combined with chromium polynicotinate and/or gymnema, is a safe and effective dietary ingredient for promoting weight control and maintaining healthy cholesterol levels.

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Continued on page 4

Diabetes: The Sleeping Giant Awakes

James LaValle, R.Ph., N.D., C.C.N.

The CDC has sounded the alarm - about 8 percent of the U.S. population is already diabetic, an alarmingly high 25% of the population has multiple metabolic syndrome, a pre-diabetic condition (discussed elsewhere in this article), and the CDC has warned that if lifestyle habits do not change 1 in 3 children today will become diabetic by age 40.

As medical professionals know, the cost of this disease to individuals and medical systems is huge. The fact is diabetes is a sleeping giant that is ready to awaken and literally sink our current health care system. Therefore, any and all tools that can be employed to improve glycemic control will be needed in preventing the onset of diabetes and delaying or hopefully preventing altogether the side effects/complications of existing diabetes.

Vitamins, minerals, essential fatty acids, herbs, and other nutraceuticals are cost-effective agents that can be rationally employed to profoundly affect diabetes control and offer protection against the debilitating and even fatal complications of diabetes.

Medical journals have published numerous studies delineating the role of several vitamins, minerals, and nutraceuticals in controlling blood sugar itself or the complications of the disease. The studies are so strong that some nutritionists consider diabetes at least in part, a deficiency disease, not of one nutrient but several, like chromium, magnesium, and zinc.

Most of the complications of diabetes are related to three areas- glycation, oxidative stress and inflammation.

Glycation is a process that occurs when blood glucose levels remain elevated for long periods of time, the glucose molecules begin to attach themselves to fat and proteins in the body. This damages enzymes and other tissues and alters how they function in the body. Glycosylated hemoglobin (HbA1c) is one example of a glycated substance in the body; it is routinely measured in diabetics as a way to monitor compliance with medical treatment and diet. Studies have found that the higher a person's HbA1c, the higher their risk of developing cardiovascular disease and/or dying. Glycated tissues lead to formation of what are known as glycated end products (AGEs), which are thought to be more damaging to the body than oxidative stress from free radicals. Studies have shown that elevated blood glucose levels lead to increased inflammation. Diabetes and multiple metabolic syndrome are known to have a strong underlying inflammatory aspect. Markers of this inflammation include C-reactive protein (CRP), TNF - alpha, interleukin-1 beta (IL-1b), interleukin 6 (IL-6), and others. High inflammatory markers greatly increase one's risk of heart disease and other chronic diseases.

Glycation and inflammation are responsible for the damage that occurs to the tissues of the body, whether it be the retina of the eye, the kidney tubules, nerve tissue in the brain or periphery, vascular walls, etc. This is why you see such a variety of complications from diabetes. The goal of diabetes management then is to keep fasting blood sugar levels as close to normal as possible and to control inflammation and oxidative stress.

Continued on page 6

Combat Metabolic Syndrome X

Stephen Holt, MD, MRCP (UK), FRCP (C), FACP, FACG, FACN, FACAM

The metabolic Syndrome X is the combination of obesity, hypercholesterolemia and hypertension linked by underlying resistance to insulin. Syndrome X is often associated with excess insulin secretion. While this syndrome was described initially by Gerald Reaven, M.D. in 1998 (1), the principal component of obesity in Syndrome X was not initially emphasized. Retrospective National Health Nutritional Survey data from the period 1988 to 1994 implied that 47 million Americans had Syndrome X (2). Current prevalence of this syndrome may now be as many as one in four of the adult population (70 million Americans). So common and so pernicious are the negative health outcomes of the metabolic Syndrome X that it qualifies as the number one public health initiative facing several Western societies.

The Effective Management of Syndrome X

Current pharmaceutical and surgical approaches for the management of Syndrome X possess many disadvantages and limitations. It is proposed that focused treatments of the components of Syndrome X are not likely to provide better outcome than integrated management strategies (2). Excessive dietary intake of refined sugar, lack of exercise, poorly defined genetic tendencies and adverse lifestyle variably contribute to the pathogenesis of Syndrome X. These proposals are consistent with dietary attempts to restrict carbohydrate intake and may explain the short-term success of some fad diets for weight control (3). There is no known pharmaceutical that is versatile enough to manage the metabolic Syndrome X.

Syndrome X as a Gateway to Other Disease

While Syndrome X is identified as a major cause of cardiovascular disease, it is less apparent that this disorder increases deaths and disabilities from all causes and it underlies female endocrine disorders, polycystic ovary syndrome, non-alcoholic fatty liver disease, non-alcoholic steato-hepatitis, gestational diabetes mellitus, significant changes in body eicosanoid status, and even certain cancers (3).

The link between diabetes mellitus and obesity through Syndrome X is especially cause for alarm. As both the incidence of weight gain and adult onset diabetes have increased in American society, we are faced with alarming proof of the connection which cannot be ignored. Maturity onset diabetes [diabetes mellitus] now affects increasingly younger members of the population, and being "overweight" has become not only a concern of middle-aged adults, but school children and their parents. This situation has been referred to as "diabesity".

Nutritional Options: The First and Best Intervention

Syndrome X has variable clinical manifestations which are proposed in an extended definition of Syndrome X into the new, unifying-disease concept of Syndrome X, Y and Z... (3). Effective prevention and treatment of Syndrome X involves a multifaceted approach to impact all cardinal components of the disorder (3).

Continued on page 5

Nutrition Update – Continued from page 2

Source: Preuss HG, Bagchi D, Bagchi M, Rao CVS, Dey DK, Satyanarayana S, Effects of a Natural Extract of (-)-Hydroxycitric Acid (HCA-SX) and a Combination of HCA-SX Plus Niacin-Bound Chromium and Gymnema Sylvestre Extract on Weight Loss, Diabetes, Obesity & Metabolism, 6:171-180, 2004.

HCA Shown to Reduce Fat Synthesis and Food Consumption

Researchers at Hoffman-LaRoche found that consumption of hydroxycitric acid (HCA), reduced the rate at which fat was stored in the liver, fat tissue and small intestine of animals. Animals receiving HCA also had lower food consumption than animals receiving a placebo. Researchers at Creighton University have shown that HCA increases the release and availability of serotonin from brain tissue. Clinically, I have experienced that increasing serotonin levels has a dampening effect on food cravings and hunger in patients consistent with studies showing that increased brain levels of serotonin have been linked with appetite suppression. I frequently use 5-HTP as a precursor to serotonin in my diabetic and weight management patients.

Another key nutritional supplement we recommend for our diabetic patients is chromium polynicotinate. There have been several new studies addressing the effectiveness of chromium polynicotinate and improved glucose metabolism.

Chromium Polynicotinate Improves Fasting Glucose Levels


Metabolic problems such as obesity, unhealthy lipid profiles, glucose intolerance and hypertension become more common with increasing age. Suboptimal chromium intake, a common prevalence in the U.S. and western cultures, can also contribute to these metabolic disorders. Chromium polynicotinate participates in glucose metabolism by enhancing the effects of insulin, the pancreatic hormone that provides cells with glucose for energy and maintains normal blood glucose levels. Chromium also influences protein and fat metabolism. There is a unique oxygen-coordinated niacin-bound form of chromium that has been shown to promote healthy lipid profiles and glucose metabolism in animals and humans. In the present double-blind clinical investigation, 2 groups of volunteers received either 300 micrograms of chromium polynicotinate or a placebo daily for 3 months. The results of the study showed that the chromium polynicotinate supplement significantly lowered fasting glucose levels, which remained unchanged in the placebo group. The chromium supplemented group also experienced decreases in triglyceride levels and glycosylated hemoglobin levels (HbA1c), the biomarker for long-term glucose control. I have seen chromium polynicotinate consistently improve altered glucose and lipid levels in my patients with diabetes and impaired glucose metabolism. Several studies have also confirmed the safety of chromium polynicotinate in the clinical setting.

Source: Yasmin T, Shara M, Bagchi M, Preuss HG, Bagchi D, Toxicological Assessment Of A Novel Niacin-Bound Chromium, Known To Ameliorate The Symptoms Of Metabolic Syndromes, Journal of the American College of Nutrition, 45th Annual Meeting, abs 77, October, 2004.

Practice Pointers

Given the constraints of clinical practice our best laid plans

may not be able to be implemented due to the reality of time and financial constraints. Spending the time necessary to fully educate patients is very labor intensive and can be economically adverse to the practicing clinician. To help offset these obstacles we have successfully taught functional medical concepts to our patients in both group and individual settings. The group atmosphere is best scheduled in the evening at a location with a large white board or drawing surface to make diagrams and pathways to illustrate specific points. A PowerPoint presentation can also be useful and is an easy way to produce handouts for patients to take home. In addition, many downloadable resources are available on the internet, in the public domain, now that a national educational effort is underway to inform the public about the increasing prevalence of diabetes. Frequent visits to the health care provider have also been important in maintaining compliance and supporting the patients lifestyle changes. Physiological feedback such as bioimpedance analysis, body composition, BMI measurements and direct weight measurements as well as laboratory analysis and review of daily glucose measurements can be very encouraging to patients and can promote their continued success.

Combining a targeted nutraceutical approach with tangible dietary modification and effective exercise has been a mainstay of our practice approach to those with diabetes. Early detection via HbA1c testing has been very beneficial in finding those “borderline” diabetic or “pre”-diabetic patients who are extremely motivated to reverse their condition. Those who have been diagnosed and have been placed on traditional treatments have also benefited by nutritional intervention, by adding specific nutraceutical supplements and by increasing their physical activity. We have had the delight in reducing medications, and in many times discontinuing traditional medications when sound functional medical interventions are implemented. Our patients are exceedingly happy with this approach and the self-fulfillment as a health care provider involved in the process is priceless. Ultimately the “proof lies in the pudding” and the positive benefits my patients have attained using natural products to supplement their lifestyle modifications has been a living testimony to the effectiveness of high quality nutritional supplementation from a respected source. 

Dr. Cherewatenko is the author of “The Diabetes Cure” and “The Stress Cure”, as well as a number of patient education programs, doctor education programs and multiple community health and wellness seminars. Dr. Cherewatenko is board certified by the American Board of Family Practice and is Board Eligible by the American Board of Bariatric Medicine. Dr. Cherewatenko is in private clinical practice in Renton, Washington. HealthMax Incorporated is a full service family practice clinic that specializes in wellness medicine including Obesity and Weight Management, Diabetes, Food Allergy Testing, Genomics and Proteomics, Functional Medicine, Digestive Disorders, Stress Management, and Nutritional Medicine.

He received his Doctor of Medicine degree from the University of Washington School of Medicine in 1986 and completed his Family Practice Residency at the University of Washington, Valley Medical Center, Family Practice Residency in 1989. He also has a Masters Degree of Education in Counseling Psychology and a BS in Psychology & Pre-Medicine from Montana State University.

Combat Syndrome X – Continued from page 3

Current allopathic treatments (drugs) have been too focused on individual components of Syndrome X; and they tend to form only a “back-up plan” for management. In contrast, natural approaches with lifestyle modification and nutritional and/or nutraceutical interventions may provide versatile and powerful, first-line management options:

- 1. Lifestyle change** – with specific avoidance of substance abuse, including smoking cessation, reduced caffeine and simple sugar intake.
- 2. Behavior modification** – Change eating patterns and amounts. Extinguish adverse lifestyle.
- 3. Exercise** – matched to the level of aerobic fitness; medical or professional training advice recommended.
- 4. Diet** – reduced in simple sugars, salt and saturated fat with controlled protein intake and more liberal healthy fats, e.g. fish oil (EPA).



Redefining Syndrome X

- **Classic Definition:** Obesity, Hypercholesterolemia, High Blood Pressure, linked by Insulin Resistance.
- **Syndrome X, Y, Z...**: An expanded definition incorporating a novel unifying concept of common diseases.

Dietary Fiber: A Potent Weapon Against Syndrome X

Many types of soluble fiber may benefit individuals with Syndrome X by their effects on appetite, weight control and blood cholesterol (3). Evolution of research into soluble components of dietary fiber has led to the discovery of fractions of oat soluble fiber (beta glucans) which have been shown to effectively lower blood cholesterol, reduce post-prandial blood glucose, induce satiety and result in appetite suppression (4-7).

While these beta glucan containing glucocolloids have physico-chemical properties that modulate upper gastrointestinal motility (delay gastric emptying) (8) and retard or impede specific macronutrient absorption (glucose and fats), they have intrinsic metabolic effects (IMEF). These metabolic effects occur largely as a consequence of the fermentation of soluble oat fiber in the colon to produce short-chain fatty acids (propionate, aceto-acetate and butyrate). Propionic acid can enter the portal circulation of the liver and it may interfere with cholesterol synthesis by blocking HMG Co-reductase enzyme activity (4,6).

Making the Case for Essential Fatty Acids

Recent research has underscored the importance of eicosanoid changes in Syndrome X and it is known that eicosapentaenoic acid (EPA) can enhance insulin sensitivity by presumed effects on PPAR-receptors, which regulate the actions of insulin (3). These observations open up the pathway of the development of “genome-nutraceuticals”. Dietary approaches, using fad diets for weight control, require reappraisal (3), as high saturated fat diets designed to induce dietary ketosis (Atkins’ Diet) or diets involving protein-loading (Sears’ Zone Diet) masquerade as the meritorious “low carb lifestyle”.

Diets to combat Syndrome X should have more liberal

“healthy fat” recommendations (omega-3 and 6 fatty acids in the correct balance, about 2:1, omega-3 to 6), with strict control of refined carbohydrate intake, restricted salt intake, enhanced fiber intake and a move toward vegetable sources of protein (9).

A New Global Weight Control Initiative

The “balancing” effects of beta glucans on blood glucose are part of the concept of the Glycemic Index of food, which is relevant to new dietary guidelines to combat Syndrome X (3,8). A major component of the Glycemic Index is related to altered rates of sugar absorption, determined to a significant degree by altered rates of transfer of glucose to its site of maximal absorption in the small bowel (a function of gastric emptying rate) (3,8,10).

Conclusion

Currently, lifestyle change and nutritional interventions with condition-specific dietary supplements (10) may have more to offer the prevention and treatment of Syndrome X than existing management strategies (3,10). Combat against the components of Syndrome X, Y and Z... has become the most important current public health initiative in Western Society (3,10). There is a new global healthy weight loss initiative which must include a comprehensive approach (3,10) to treat all disorders within the metabolic syndrome (Syndrome X of Reaven or Syndrome X, Y and Z... of Holt). The control of the metabolic Syndrome X has great implications for diabetes prevention, because the constellation of problems in Syndrome X, especially obesity, are key determinants of progression in the “diabetic diathesis”. One may ask: Why is the metabolic syndrome a missing diagnosis in patients’ charts, when at least 70 million Americans are afflicted with this life-threatening disorder?

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Stephen Holt, M.D. is a physician and best-selling author from New York. He is the founder and president of Natures Benefit, Inc. and has authored the book “Combat Syndrome X, Y and Z...” (Wellness Publishing, Newark, NJ, 2002), and coauthored “Nutritional Factors for Syndrome X”.

Sleeping Giant – Continued from page 3

And finally, because insulin is not working optimally in diabetics, there is reduced delivery of nutrients to all the cells of the body. If the cells of the body are not receiving glucose for energy production and co-vitamins and minerals, their function is compromised. Nutrient deficiencies can also lead to the poor wound healing and higher risk of infection seen in diabetics.

Nutraceuticals

Alpha Lipoic Acid (ALA): Alpha lipoic acid and its reduced form dihydrolipoic acid may well be the single most important nutraceutical for diabetes. They are potent antioxidants that have been shown to significantly reduce the symptoms of neuropathy and improve neuropathic deficits in diabetic patients. Dihydrolipoic acid can regenerate glutathione, thioredoxin and vitamin C as well as scavenge superoxide and peroxy free radicals. It has also been shown to improve insulin sensitivity by recruiting glucose transporter-4 to plasma membranes causing uptake of glucose. New studies have also suggested that ALA stimulates glucose disposal in patients with Type II diabetes. In experimental and clinical studies ALA markedly reduced diabetic pathologies including: cataract formation, vascular damage and polyneuropathy. It has also shown itself to be of benefit in sparing and protecting the nephrons of the kidneys therefore reducing glomerular injury. The clinical dose for a person with diabetes is a minimum of 600mg daily in divided doses.

Coenzyme Q10: The importance of this nutrient cannot be overstated, primarily because many of the drugs that are needed for management of diabetes and/or its complications deplete CoQ10. CoQ10 can help to improve blood pressure and glycemic control in Type II diabetics. CoQ10 also helps to improve endothelial dysfunction of the brachial artery as well. Typical dosages are 90-400 mg/day in divided doses.

N-Acetyl Cysteine: NAC should be considered an essential supplement in the care of patients with Type II and Type I diabetes. NAC decreases plasma soluble vascular cell adhesion molecule-1 in non-insulin dependent diabetics. Over time this can significantly decrease the progression of vascular damage that occurs with diabetics. It also helps to protect the integrity of erythrocytes and reduces structural changes in type II diabetics. NAC may also reduce the glycation processes that lead to cataract formation. Typical dosage 1200-1800 mg per day in divided doses.

Essential Fatty Acids: especially omega-3 fatty acids from fish have been shown to have multiple benefits in the management of diabetes. They can improve glucose tolerance and lipid profiles in people with diabetes. More importantly omega-3 fatty acids helps to reduce C-reactive protein, and the formation of the F₂ isoprostanes both of which significantly contribute to inflammation and the accelerated progression of complications associated with diabetes. In one study F₂ isoprostanes were reduced 20-27% which means a significant reduction in oxidative stress and formation of atherosclerotic plaque.

Taurine: Taurine has been shown to significantly reduce platelet stickiness. This is important for diabetics as their uptake of Taurine appears to be modified possibly due to the increased osmolytes in their plasma. Typical dosage: 1000–1500 mg/day.

Vitamins/Minerals

Carotenoids: Some of the strongest literature and research that exist for a nutritional supplement is on the carotenoids, which significantly reduce the potential risks for people with diabetes. High circulating lycopene concentrations are associated with reduced cardiovascular disease. In a population-based study it was found that a diet rich in carotenoids may actually be a protective factor in the development of hyperglycemia. Carotenoids are powerful antioxidants that have a protective effect on the lens of the eye, on the arteries and other tissues.

Zinc: Zinc plays an important role in the synthesis, storage and secretion of insulin as well as preserving the integrity of insulin; zinc deficiency may adversely affect the ability of pancreatic islet β-cells to produce and secrete insulin. Therefore, adequate zinc intake is known to be needed for proper insulin production. Zinc intake is also important for the prevention of diabetes and related conditions. Studies have correlated diabetes and glucose intolerance with lower intakes of dietary zinc. Interestingly, low dietary zinc intake is also associated with a higher prevalence of hypertension, hypertriglyceridemia and low high-density lipoprotein cholesterol levels, all of which are commonly seen in diabetics. Studies have shown that supplementing zinc in diabetics can restore plasma zinc levels to normal in as little as three months. Zinc supplementation in diabetics has also been shown to decrease markers for oxidative stress. After six months, there was an additional decrease in plasma markers of oxidative stress. Diabetes tends to lead to poor wound healing - zinc is known to be an extremely important mineral for wound healing. Typical dosing for people with diabetes would be 50-100 mg per day in divided doses.

Magnesium: Magnesium is needed for insulin to work efficiently. Supplementation with magnesium in diabetics has been shown to increase low plasma Mg levels, improve insulin production and sensitivity, and in some trials to lower the insulin injection requirements of diabetics. Magnesium deficiency is positively correlated with elevations in glycosylated hemoglobin and appears to play a role in the development of retinopathy. In addition a recent study showed that low magnesium levels were directly correlated to the development of Type II diabetes. It is interesting to note that according to U.S. Government statistics approximately 75% of the population gets below the RDA for magnesium. To add to this, many of the medications used to manage diabetes and metabolic syndrome deplete magnesium from the body. Typical dose for a person with diabetes is 600-1000mg per day in divided doses, but be cautious on the high side of dosing because it may trigger loose stools.

Vitamin E: Vitamin E has been shown to reduce glycosylation of tissues. Vitamin E enhances immunity and reduces the number of infections in people with higher plasma vitamin E levels. One study showed that vitamin E helped to enhance glutathione levels and have a protective role in magnesium deficiency-induced cardiac lesions. Alpha-tocopherol was found to decrease both C-reactive protein and the cytokine interleukin-6 in normal volunteers and type II diabetic patients as well. Vitamin E works synergistically with other nutrients, helping to protect against nerve and kidney damage. Given the recent vitamin E scare in the media, it should be reinforced to patients that the

Continued on page 8

Going Grey, Gaining Weight: The Road to Type 2 Diabetes

Dr. Ronald Klatz and Dr. Bob Goldman

Type II diabetes [also known as non-insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes] accounts for about 90 to 95% of all diagnosed cases of diabetes. As of the year 2002, 18.2 million Americans (6.3 % of the total population) have diabetes.

Diabetes can result in a number of medical complications, such as heart disease and stroke, hypertension, blindness, kidney disease, nervous system damage, and periodontal disease. People with diabetes are more susceptible to many other illnesses and, once they acquire these illnesses, often have worse prognoses. Diabetes also multiplies the cost of treating other diseases. Aging itself increases an individual's susceptibility to type II diabetes. In November 2004, Dr. Charlotte Ling and colleagues from Lund University (Sweden) examined the effects of insulin on levels of PGCs in muscle. PGC-1alpha and PGC-1beta are two transcription factors, responsible for activating the conversion of protein to glucose, that are found in decreased levels in the skeletal muscle of those with type 2 diabetes. Dr. Ling's team found that expression levels of PGC-1alpha and PGC-1beta in muscle are increased by insulin stimulation and decreased by aging. This age-dependent decrease may explain, in part, the wide variability in susceptibility of individuals to type II diabetes as we age. Dr. Ling's study also found that PGC-1alpha and PGC-1beta influenced different aspects of glucose metabolism, lending insights into the complex interaction between genetic and environmental influences – such as age – on the development of insulin resistance and type II diabetes. The finding that the age-dependent decrease in expression of the key genes regulating glucose metabolism could explain how age can act as a trigger to modify genetic susceptibility to type II diabetes.

A study published in December 2004 by researchers at the University of Michigan and the Department of Veteran's Affairs, underscores the extent of the financial burden of diabetes on older adults in particular, and the nation as a whole. Researchers analyzed data from the Health and Retirement Study, which involves a nationally representative sample of 22,000 Americans age 50 and older. Dr. Sandeep Vijan and colleagues found that by the year 2000, sick days, disability, early retirement, and premature death of diabetic Americans born between 1931 and 1941, estimated at 2.3 million people, cost the country almost \$133.5 billion in lost wages and reduced productivity over the entire lifetime of this group.

Clearly, the medical and financial impact of diabetes across all age groups, and particularly among the older population, is staggering. Additional concerns are raised when factoring in the role of overweight and obesity, a major public health issue affecting nearly 64% of the American population, as a risk factor for the development of insulin resistance and subsequent onset of diabetes. Recent research, conducted at the Novartis Institutes for Biomedical Research (Massachusetts) and the Naomi Berrie Diabetes Center at Columbia University (New York), has identified the molecular pathway link that connects obesity with insulin resistance. The scientists found that obese fatty tissue is characterized by the infiltration of macrophages, and that these macrophages are an important source of inflammation in this tissue. Consequently, those who carry extra weight are at an increased risk of the onset of diabetes. The mechanism for two nutritional approaches that may prevent the onset of diabetes in the overweight/obese have recently been elucidated:

Magnesium. Studies suggest that a deficiency in magnesium may worsen blood glucose control in type II diabetes. Specifically, it is posited that a deficiency of magnesium interrupts insulin secretion in the pancreas and increases insulin resistance in the body's tissues. In addition, evidence suggests that a deficiency of magnesium may contribute to certain diabetes complications. Two studies by separate research teams at the Harvard School of Public Health and published in early 2004 found that a diet high in magnesium may help to prevent the development of type II diabetes. In the first study, which involved 85,000 women (tracked for 18 years) and 42,000 men (followed for 12 years), scientists found that those men and women whose diets included the largest amounts of magnesium were the least likely to develop type II diabetes. The second study, in which 40,000 women participated, found that overweight women who consumed large amounts of dietary magnesium were 22 percent less likely to develop type II diabetes than those who consumed lower amounts of the mineral.

Vitamin E. In the fall of 2004, a research team from the University of Otago (Dunedin, New Zealand) reported finding that high-dose vitamin E appeared to temporarily improve insulin resistance among adults who were overweight. Dr. Patrick Manning and colleagues also found that vitamin E was able to reduce levels of alanine transferase, a liver enzyme commonly elevated in people prone to the onset of diabetes. These results suggest that vitamin E could have a role in delaying the onset of diabetes in individuals who are at-risk for the disease.

With an estimated 5.2 million Americans going undiagnosed for diabetes, and the pace of new cases increasing at the rate of 1.3 million a year, the costs of the disease are significant in terms of how it impacts individuals, families, and society at-large. The American population is both going gray and gaining weight – two trends that increase the number of people at-risk for developing type II diabetes. Find out how you can gain the knowledge to help your patients to identify, prevent, and treat type II diabetes from an anti-aging perspective.


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Dr. Ronald Klatz and Dr. Bob Goldman are physicians and co-founders of the anti-aging medical movement and of the American Academy of Anti-Aging Medicine (A4M; Chicago, IL USA; www.worldhealth.net), a non-profit medical organization dedicated to the advancement of technology to detect, prevent, and treat aging related disease and to promote research into methods to retard and optimize the human aging process. A4M is also dedicated to educating physicians, scientists, and members of the public on anti-aging issues.

Sleeping Giant – Continued from page 6

overwhelming amount of literature that supports vitamin E intake to reduce complications of diabetes. Dosage 200-1200 I.U. daily.

Herbs: Several herbs have been shown in animal and human trials to improve diabetes control. *Gymnema sylvestre* leaf extract, fenugreek seed extract, and bitter melon whole fruit extract have all been shown to lower blood sugar levels. Bilberry extract helps prevent and reduce the severity of diabetic cataracts. Cinnamon extract deserves a special mention as it has probably shown the most consistent and significant blood sugar lowering properties of any herb or spice. Cinnamon given in different doses lowered blood glucose by 18-29%, triglycerides 23-30%, and total cholesterol 12-26%. These effects were observed in as low as 1 gram/day. However, the LDL lowering was greater as the dose increased, with the six gram dose lowering LDL by 24%. Standardized cinnamon extracts are now available, allowing for a reduced dose. The typical dose for a person with diabetes is 125 mg of a standardized extract 2-3 times a day. 

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