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Soft Drinks Can Deplete Potassium and Lead to Muscle Weakness, Fatigue

Consuming large amounts of sugary, caffeine-containing soft drinks can lead to a serious loss of potassium, resulting in muscle weakness, fatigue, and even paralysis, according to two reports in the *International Journal of Clinical Practice*.

Potassium is an essential dietary mineral that functions as an electrolyte, meaning that it helps transmit electrical signals in the heart and other muscles.

In the first article, Moses Elisaf, MD, and his colleagues at the University of Ioannina, Greece, reviewed several published patient histories linking muscle weakness, extreme fatigue, and paralysis to soft drinks.

Elisaf wrote that large amounts of glucose can lead to excessive urination and then to potassium losses. Large quantities of fructose, such as in the form of high-fructose corn syrup, can lead to diarrhea and reduced potassium levels. Caffeine, found in soft drinks and coffee, can cause potassium deficiency, either through redistribution of potassium reserves in cells or via increased urination.

Clifford D. Packer, MD, of the Veterans Administration Hospital, Cleveland, Ohio, described several case histories of patients who had been consuming two to nine liters (approximately 2.1 to 9.5 quarts) of cola drinks daily for months.

One of the cases was a 51-year-old man with high blood pressure and chronic obstructive pulmonary disease, gastroparesis (gastric paralysis), and two to three loose bowel movements daily. Medical treatments did not help. "One day he showed up at my office with a 2-liter bottle of Pepsi-Cola in the basket of his electric scooter," wrote Packer. "I asked him how much he drank, and he said that he sipped it continuously, 4 liters per day. He was not willing to stop drinking cola, but he did agree to reduce his intake to 2 liters per day. His potassium then rose to the normal range, and his weakness improved."

Packer added, "With his 4 liter per day Pepsi-Cola habit, my patient was ingesting 396 grams [almost a full pound] of fructose, enough to cause a chronic low-grade osmotic diarrhea, and 400 mg of caffeine, the equivalent of about seven cups of coffee."

In most of the cases described by Elisaf and Packer, patients regained muscle strength and higher energy levels after reducing the amount of soft drinks or eliminating them altogether. Some of the patients required potassium supplements to restore normal blood levels of the mineral.

Editor's note: Most energy drinks (e.g., Red Bull, Monster, and Jolt) and many noncola soft drinks (e.g., Mountain Dew) also contain substantial amounts of caffeine. Sweetened coffee drinks, such as Starbuck's Frappucinnos, would likely have similar physiological effects.

References: Tsimihodimos V, Kakaidi V, Elisaf M. Cola-induced hypokalaemia: pathophysiological mechanisms and clinical implications. *International Journal of Clinical Practice*, 2009;63:900-902 Packer CD: 831-835. Cola-induced hypokalaemia: a super-sized problem. *International Journal of Clinical Practice*, 2009;63:833-835. ❑

Perspectives

Genuine Health-Care Reform

Whatever your political thinking happens to be, you can't deny that the American health-care system is dysfunctional and in serious need of improvement. The late Emanuel Cheraskin, MD, DMD, once said it best: Medicine is America's fastest growing failing business.

Why does health care keep getting more expensive? One reason is that the current hodge-podge system is based on earning money through interventions – e.g., physician visits, tests, hospitalizations, surgeries, and prescriptions. I'm not against making money, but the incentive is for every part of the system to encourage costly interventions. Money is made off illness; no illness means no profit.

As a consequence, there is little desire by anyone

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in health care to reduce the number of interventions or their cost. Nor is there much interest in saving money, because saving a few million dollars translates to a company losing a few million dollars in profits, and no company wants to lose money.

I do believe there is a need for some type of universal coverage. Indeed, my European associates are aghast at the thought that one of every six Americans does not have any insurance coverage to defray the cost of needed medical care. And those who do have insurance often have to haggle with their insurers about what procedures are covered and what are not. Quite simply, universal coverage is the ethical and moral way to treat our brethren.

But providing some type of universal insurance of medical coverage is not a solution in itself; costs will eventually increase, and there will eventually be more pressures to cut services or rein in costs.

Real improvement in health care must come from a concerted effort to prevent disease and to reduce the need for medical care. I believe this would be best done through improved eating habits, greater physical activity, and other positive lifestyle changes. Maybe someone will figure out that the health-care system could profit big time from prevention-oriented interventions. *–JC*

Vitamin Takers Have Lower Levels of Chromosome Damage

Taking multivitamins and some other types of vitamin supplements seems to protect telomeres, the tips of our chromosomes. Chromosomes contain our genes and genetic information.

Telomeres decrease in length with each cell division, and their length is considered a marker of "biological aging." Some research has shown that free radicals and inflammation shorten telomeres, and that shorter telomeres are associated with a higher risk of age-related diseases.

Honglei Chen, MD, PhD, of the National Institute of Environmental Health Sciences, Research Triangle Park, North Carolina, and his colleagues investigated the use of vitamin supplements and dietary intakes of vitamins in 586 men and women who ranged from 35 to 74 years of age. He and his colleagues also measured the length of the subjects' telomeres, which were obtained from chromosomes in their white blood cells.

People who regularly took multivitamins had telomeres that averaged 5.1 percent longer than those in people who did not take vitamins. The longer telomeres were comparable to a 10-year difference in aging.

People who took antioxidant supplements also had relatively long telomeres, as did those who consumed large amounts of vitamins C and E from food. Those who took vitamin B12 supplements had relatively long telomeres, but other B vitamins did not seem to influence telomere length. People who took iron supplements had shorter telomeres.

Chen wrote that "telomere attrition may eventually lead to chromosomal instability and cell death."

Reference: Xu Q, Parks CG, DeRoo LA, et al. Multivitamin use and telomere length in women. *American Journal of Clinical Nutrition*, 2009;89:1857-1863. ❑

Antioxidants May Lower the Risk of Endometrial Cancer in Women

An analysis of data from 13 previously published studies has found that several different antioxidant nutrients are associated with a modest reduced risk of endometrial cancer. The disease is the most common gynecological cancer in the United States.

Elisa V. Bandera, MD, PhD, of the University of Medicine and Dentistry of New Jersey, Piscataway, and her colleagues analyzed data from almost 18,000 people.

She reported that beta-carotene was associated with a 12 percent lower risk of endometrial cancer, vitamin C with a 15 percent lower risk, and vitamin E with a 9 percent lower risk. However, it is possible that these nutrients were simply markers of antioxidant-rich foods.

Reference: Bandera EV, Gifkins DM, Moor DF, et al. Antioxidant vitamins and the risk of endometrial cancer: a dose-response meta-analysis. *Cancer Causes and Control*, 2009; 20:699-711. ❑

Vitamin D Reduces Chronic Back Pain, Even After Failed Surgery

Supplemental vitamin D can reduce and sometimes completely resolve chronic low back pain, even after surgery fails to correct back problems, according to a physician's report describing six patients.

Gerry Schwalfenberg, MD, of the University of Alberta, Edmonton, Canada, gave the patients 1,000 to 5,000 IU of vitamin D daily. The patients had suffered chronic and sometimes severe and disabling back pain, and two of the patients had undergone back surgery that failed to resolve their pain.

Four of the patients had a complete resolution of their back pain after taking vitamin D supplements for three to six weeks. One of the patients had a recurrence of pain after stopping his supplements,

then a cessation of pain after again taking vitamin D. Two of the patients had improvements but continued taking their pain medications.

One of the patients was a 44-year-old woman who had severe back pain for years and was not able to do any housework. After taking 5,000 IU of vitamin D for three weeks, her back pain went away and her mood improved. According to Schwalfenberg, the patient described vitamin D as her "happy pill."

Reference: Schwalfenberg G. Improvement of chronic back pain or failed back surgery with vitamin D repletion: a case series. *Journal of the American Board of Family Medicine*, 2009;22:69-74. ❑

N-Acetylcysteine Supplements Reduce Compulsive Hair Pulling

A remarkable antioxidant, N-acetylcysteine (NAC) is used by conventional medicine to treat Tylenol overdose and to break up mucus in the lungs. In recent studies, researchers have found that it reduces the desire to use cocaine and to gamble. Now researchers have found that NAC can help many people break the habit of compulsive hair pulling, a condition known as trichotillomania.

Jon E. Grant, MD, JD, and his colleagues at the University of Minnesota School of Medicine, Minneapolis, treated 45 women and 5 men with trichotillomania. The subjects spent about an hour each day pulling out their hair.

They were given 1,200 to 2,400 mg of NAC or placebos daily for 12 weeks. Using two different clinical tests, Grant found that 56 percent of patients were "much or very much improved" after taking NAC, with significant improvements being noted after nine weeks. Only 16 percent of patients taking placebos improved to the same extent.

According to Grant, 44 percent of patients taking NAC benefited from at least a 50 percent reduction of symptoms, whereas none of the patients taking placebos had that much of an improvement.

Grant wrote that NAC "is available in health-food stores, is cheaper than most insurance copayments, and seems to be well tolerated."

Reference: Grant JE, Odlaug BL, Kim SW. N-acetylcysteine, a glutamate modulator, in the treatment of trichotillomania. *Archives of General Psychiatry*, 2009;66:756-763. ❑

An Extract of Green Tea Shows Promise in Leukemia Treatment

A proprietary form of epigallocatechin gallate (EGCG), the principal antioxidant found in green tea, appears to be useful in the treatment of leukemia, according to a preliminary report from doctors at the Mayo Clinic in Rochester, Minnesota.

Several population-based studies have found associations between green tea consumption and a lower risk of cancer, and animal studies have demonstrated that green tea can be protective.

Tait Shanafelt, MD, and his colleagues treated 33 patients with chronic lymphocytic leukemia, the most common subtype of the disease in the United States. The patients received 400 to 2,000 mg of EGCG twice daily.

After one month, 11 (33 percent) of the 33 patients had about a 20 percent reduction in lymphocyte numbers, a sign of reduced disease activity. In addition 11 (92 percent) of the 12 patients who began the study with enlarged lymph nodes experienced at least a 50 percent reduction in lymph node size, another sign of improvement.

Reference: Shanafelt TD, Call TG, Zent CS, et al. Phase I trial of daily polyphenon E in patients with asymptomatic rai stage 0 to II chronic lymphocytic leukemia. *Journal of Clinical Oncology*, 2009; epub ahead of print. ❑

Supplemental Vitamin K1 Slows Hardening of the Arteries

Vitamin K2 has gotten a lot of attention recently because of research suggesting that it might reduce coronary calcification, also known as hardening of the arteries. But a new study has shown that vitamin K1 works at least as well.

Sarah L. Booth, PhD, of Tufts University, Boston, and her colleagues asked 388 healthy men and postmenopausal women to take one of two supplements: a multivitamin with 500 mcg of vitamin K1 and a multivitamin without K1 for three years. The subjects' coronary artery calcification was measured at the beginning of the study and again after three years.

Of the 367 people who took their supplements most consistently – 85 percent of the time – those who got the extra vitamin K1 had 6 percent less progression of coronary calcification.

Booth wrote that the theory behind vitamin K's benefits is that the nutrient is needed to make "matrix Gla protein," a substance that inhibits coronary calcification. However, levels of matrix Gla protein did not correlate with the reduction of coronary calcification. As a result, Booth recommended that further studies be conducted to clarify the mechanism by which vitamin K reduced coronary calcification.

Reference: Shea MK, O'Donnell CJ, Hoffmann U, et al. Vitamin K supplementation and progression of coronary artery calcium in older men and women. *American Journal of Clinical Nutrition*, 2009;89:1799-1807. ❑

Continues on next page

Quick Reviews of Recent Research

• Lifestyle, diet impact "preventable" deaths

A study by researchers at Harvard University and other institutions determined the leading causes of preventable (or premature) death in the United States. Both tobacco use and untreated high blood pressure accounted for the most preventable deaths. The other causes, in descending order, were overweight and obesity, physical inactivity, high intake of salt, low intake of omega-3 fish oils, and high intake of trans fats. Correcting these lifestyle and dietary risk factors would reduce the number of deaths annually.

Danaei G. *PLoS Medicine*, 2009;6:e1000058.

• Vitamin D may reduce risk of sepsis

Vitamin D is needed for the body's production of cathelicidin, a powerful antimicrobial compound. Researchers from Emory University in Atlanta, Georgia, measured vitamin D and cathelicidin levels in seriously ill patients with sepsis (infection of the blood), seriously ill patients without sepsis, and healthy subjects. Seriously ill patients had lower levels of both vitamin D and cathelicidin compared with healthy subjects. They concluded that "optimal vitamin D status may be important for innate immunity especially in...sepsis."

Jeng L. *Journal of Translational Medicine*, 2009;7:28.

• Folic acid prevents premature births

Doctors encourage women to take folic acid or prenatal supplements containing folic acid to reduce the risk of birth defects. Researchers from the University of Texas and other institutions studied the supplement habits of 34,480 pregnant women. Those who took folic acid supplements were 50 to 70 percent less likely to have a preterm birth. The longer that women took folic acid before becoming pregnant, the lower their risk of premature delivery.

Bukowski R. *PLoS Medicine*, 2009;6:e1000061.

• Celiac disease may be on the rise

Celiac disease is an intolerance of gluten, a protein found in wheat, rye, and barley. Researchers at the Mayo Clinic, Rochester, Minnesota, investigated markers of celiac disease in 9,133 blood samples obtained between 1948 and 1954 from members of the U.S. Air Force. The researchers also analyzed 5,558 blood samples from other people of the same generation (now around age 70), as well as 7,200 blood samples from people in their 30s (i.e., a more recent generation). They found that 0.2 percent of the people from the original Air Force group had undiagnosed celiac disease, and that they were four times more likely to die from any cause. In addition, the rate of undiagnosed celiac disease was more than four times higher in the more recent generation.

Rubio-Tapia A. *Gastroenterology*, 2009;137:88-93.

• High-glycemic breakfast hurts blood vessels

Researchers from Israel tested the effects of high- and low-glycemic breakfasts on 56 overweight and obese (but not diabetic) subjects. The volunteers were given two types of high-glycemic breakfasts (one consisting of glucose and the other of cornflakes) and a low-glycemic breakfast (high-fiber cereal) on different days. Post-meal blood sugar levels increased significantly among the subjects consuming either glucose or cornflakes, compared with the high-fiber cereal. In addition, the two high-glycemic breakfasts led to a significant reduction in endothelial function, or blood-vessel tone. Poor endothelial function can negatively affect blood vessel flexibility and blood pressure.

Lavi T. *Journal of the American College of Cardiology*, 2009;53:2283-2287.

• Lipoic acid reduces carpal tunnel symptoms

Italian researchers used two types of nutritional therapy to treat 112 patients with moderately severe carpal tunnel syndrome. Some patients were given a combination of 600 mg of alpha-lipoic acid and 360 mg of gamma-linolenic acid daily for three months, while the others received a high-potency B-complex supplement. The alpha-lipoic acid and gamma-linolenic acid significantly reduced symptoms, whereas those getting the B vitamins did not.

Di Geronimo G. *European Review for Medical and Pharmacological Sciences*, 2009;13:133-139.

• Adequate zinc protects against DNA damage

Researchers from Oregon State University investigated the relationship between zinc and DNA damage in people. Zinc deprivation increased DNA damage, whereas zinc repletion reduced the damage.

Song Y. *American Journal of Clinical Nutrition*, 2009; 90:321-328.

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