DOWNLOAD PDF THE CELLULAR BASIS OF CARDIOVASCULAR FUNCTION IN HEALTH AND

Chapter 1 : How Healthy Nutrition Builds Health, Starting With the Cells (Graphics)

This volume is based on the proceedings of a meeting held to honour the 60th birthday of Naranjan S. Dhalla. The papers presented deal with the cellular basis of cardiovascular function in health and.

The protective bran contains a host of micronutrients to protect the young sprout from damage by sun, which can cause free radical formation, as well as other environmental damage. These same compounds protect our cells from damage, which is one reason why the bran is such a healthy food source for us. Your cells need a full spectrum of vitamins, especially the B-vitamins, to support energy production and keep the level of offshoot free radicals at a minimum. Your cells also need healthy fats like the omega-3 fatty acids and a good source of proteins to support healthy, protective membranes. And, your cells need a high intake of antioxidants, like the vitamin E family compounds found in the germ of whole grains, vitamin C found in citrus foods, and the carotenoids from vegetables to protect against free radical damage to your DNA, which can cause mutations. A range of other phytonutrients can also act as antioxidants and help protect your cells and DNA from free radicals; these include anthocyanidins from fruits like grapes and strawberries, and catechins found in green tea and fruits like grapes. Once unprotected, your DNA can develop mutations which can cause the cell to be unable to function, or even to become malignant cancerous. Nutrition and the cellular membrane The envelope that encapsulates the cell is referred to as the cellular membrane. The cell membrane serves as the structural boundary that encloses each of your cells and keeps their internal machinery like the energy producing reactions safe, so they can function properly. Fats constitute the boundaries of your cells You cellular membrane is primarily composed of fats. The fats, being non-water soluble, form a barrier that gives your cells their boundaries and structure. Many of the fats that compose the membrane are known as phospholipids, which are a combination of fatty acids, a carbon backbone to which they are attached called glyercol, and phosphate. Proteins in your cell membranes are important for many cell functions Proteins are also a major component of your cells. Outside of your cells, proteins constitute bone and soft tissue and help these structures to maintain their shape. Because they can be made into many different shapes and sizes, and they also constitute digestive enzymes, the antibodies in your blood, and serve many other functions. Proteins have many functions inside your cells as well. Proteins are located in your cell membrane, within the cell itself, and around your cells. The proteins that compose the cell membrane serve a variety of important purposes, such as communication between your cells, and providing sites of attachment, so your cells can connect with the structures around and stay where they should. For example, bone cells attach to the bone matrix through proteins on their cell membranes, and liver cells stay in the liver by attaching to the liver tissue matrix through specific attachment proteins in their cell membranes. So, the proteins in your cell membrane are important not just for the functioning within the individual cell, but also for the health of your whole body. Your cells must constantly communicate with each other, taking in nutrients from your bloodstream, and excreting wastes. Your cells do this by having proteins that respond to signals from your body stuck into each their membranes. This communication is vital for your ability to function as a whole body with all your cells working together. As an example, think about when you eat a meal. The sugar glucose is released and taken into your body through the digestion process, during which it enters your bloodstream. Your body responds to the glucose in your blood by secreting insulin from your pancreas into your bloodstream. This glucose is then either used by the cell to produce energy or is stored for future energy production. In particular, the fats you eat have a direct effect on your cells because they become your cell membranes. Unsaturated fats, like the omega-3 fatty acids found in fish and nuts, are needed for your cell membranes to have the correct shape and ability to communicate. Eating healthy levels of unsaturated fats, especially the omega-3 fatty acids, and avoiding trans-fats and saturated fats is one way to support healthy cell membranes. Two other dietary compounds, which are also components of your cell membranes and support healthy cell functioning, are inositol and choline. Inositol, which helps transport signals across the membranes of your cells, is found in the bran of grains, like wheat bran or brown rice. Choline is necessary to make the phospholipids, the form of lipid in your cell membranes, and serves many other functions in your body. Choline is present in high amounts in the yolk of eggs. Cereals, grains, vegetables and fruits also contain many molecules that help protect the fats in your cell membranes from damage. These protective nutrients include the vitamin E family of molecules, called the tocopherols, which are found in highest levels in the oils in grains, e. And, because your cells frequently use proteins as messenger molecules in their communications, the quality of the protein you eat is also important in supporting healthy cell membranes. Nutrition and your DNA The cell membrane surrounding your cells is not the only lipid membrane in your body. Within each of your cells is a smaller spherical nuclear membrane within which your DNA is encased. DNA is composed of nucleotides that are made of nitrogen-containing compounds attached to sugar molecules and phosphate. They are arranged in strands in a helix formation, unwinding to create a small intermediate messenger molecule, called RNA, which transports the information from the DNA, through the nuclear membrane, to the cytoplasm where it can be read. From the instructions provided by RNA, new proteins are synthesized. Specific areas of DNA that provide the code for individual proteins are known as genes, and genes are arranged in structures called chromosomes. Unfortunately, your DNA can easily become damaged by a host of different factors. Damaging toxins, especially ones that are lipid fat soluble, as are many pesticides, can get across both the cell membrane and the nuclear membrane. When they do, they can attach to the DNA, causing it to lose its shape or to break a strand. Damage can also occur from compounds called reactive oxygen species ROS , a type of free radical, which are toxic by-products of altered or unhealthy energy production within your cell. DNA damage of this type is called a mutation. It is vital to protect the integrity of your DNA. When their helix strands break and their structure becomes compromised, not only are you unable to make the correct types and amounts of proteins necessary for the proper functioning of your body, but these mutations can lead to cancer. Supporting healthy membranes by eating foods that provide unsaturated fats and avoiding those with saturated and trans-fatty acids is one way to protect your DNA. Eating organically grown foods is another way to protect your DNA since by eating organic, you minimize your exposure to pesticide residues in food. Minimizing the use of pesticides not only agriculturally, but also on our lawns and flowerbeds, and supporting businesses that do not use toxic environmental compounds is another way to protect your DNA from damage. Maintaining adequate dietary levels of protein, inositol, choline, the antioxidant vitamins such as vitamins E and C, and the carotenoids is also important for the health of your DNA, as well as for supporting healthy energy production by decreasing the amount of damaging free radicals inside your cells discussed below. Nutritional support for healthy DNA also includes adequate dietary intake of folate and vitamin B12, since these micronutrients are involved with DNA replication and repair. Folate is found in high levels in green vegetables, grains and eggs, and vitamin B12 can be obtained from eggs, dairy, meat and fish. Nutrition and energy production: The miniaturized organs are called organelles, and they carry out much of the day-to-day functions in your cell. Some of the most important organelles in your cells are the energy-producing powerhouses, called the mitochondria. The mitochondria are the place where your cells produce the energy they need from the nutrients in the food you eat. Each of your cells has several hundred to over two thousand mitochondria inside of them, depending on their need for energy. All together, your body has over one quadrillion mitochondria that are constantly producing energy. How Mitochondria produce energy Mitochondria use oxygen and the nutrients from the food you eat to produce energy. Most of the energy produced by your mitochondria comes from breakdown of glucose or fat from your diet. Since the mitochondria produce the energy used by other parts of your cells and throughout your body, they must have some way to transport this energy. They do this using a molecule called adenosine triphosphate, or ATP. ATP is like an energy currency in your body: ATP transports energy through a high-energy phosphate that is removed at the site where its energy is used. On an average day in which you are not doing anything particularly strenuous, you will use the equivalent of roughly half of what you weigh in ATP, about 40 kilograms. The production of energy uses a multitude of nutrients, as well as many other molecules from food. What nutrients do mitochondria need? The attachment of the high-energy phosphate to ADP to form ATP is a complex process -- not surprising, since energy is the basis for everything that happens in your body and is what drives life at its most basic level. The food you eat must first be prepared for the ETC. To do that, your body takes the glucose or fat molecule and breaks it down to smaller units of two carbons. These two-carbon units are then stripped of some of the energy units, called electrons, and broken down to carbon dioxide, which is transported out of the mitochondria as a waste product. The ETC moves, or passes these electrons down through a chain of proteins, almost like an electron river in which the proteins are the river banks. The electrons are deposited at the end of the protein chain on the inside of the double membrane in the mitochondria, which creates an electron gradient, like a dam reservoir at the end of a river. The ETC uses five enzyme complexes in its membrane to create this electron reservoir, and also burns oxygen as part of this process. At the end of the ETC is the energy dam, or gate that, when opened, allows the electrons to flow through and, like a dam, transfers the energy to create ATP. Included in the middle of the ETC is the nutrient Coenzyme Q10, which is extremely important in the electron transport and membrane protection. The ETC is also composed of proteins that require iron and sulfur, nutrients you must also obtain from the foods you eat. Iron is present in whole grains, and good food sources of sulfur are the cruciferous vegetables, like broccoli. Maintaining the structural integrity of your mitochondria is inherently important to your overall health and well-being. If tissues and organs, especially those that have higher energy requirements like the muscle, heart and brain, do not receive adequate supplies of energy, they cannot function properly. Consequently, mitochondrial dysfunction is considered one of the major underlying factors in unhealthy aging and fatigue. Along with the inability to produce energy, when damaged, mitochondria can also produce damaging by-products, such as reactive oxygen species, a type of free radical species that can destroy DNA, protein, and fats, promoting further damage. Nutritional support for healthy energy production includes supporting healthy membranes. In addition, since B-vitamins are so important, adequate intake of vitamins B1, B2, B3, B5 and B6 is extremely important to support energy metabolism. Good sources of these vitamins include whole grains, since the B vitamins are concentrated in the bran of grains. Whole grains are an excellent source of the entire complement of energy-related B-vitamins. Wheat germ is one of the highest sources of tocopherols, the family of vitamin E micronutrients, and brown rice contains oryzanol and ferulic acid, known to be effective antioxidants and health-promoting compounds. Mitochondrial energy production requires oxygen to convert fuel molecules to carbon dioxide. Paradoxically, oxygen is such a powerful reactant that it can disrupt cellular function and impair metabolism through the production of reactive oxygen molecules known as Reactive Oxygen Species. Research shows that these molecules cause cumulative oxidative damage which is associated with many degenerative conditions, including cancer, atherosclerosis, cataracts, inflammation and autoimmune disease, lung disease, neurologic disorders, aging, and cell death. Proper nutrition plays a critical role in neutralizing them damaging chemicals and protecting cellular health. Free radicals are oxidants, which are very reactive molecules that bind to and break DNA chains, directly causing mutations. They can also bind to and destroy proteins and fats in cell membranes. Under normal conditions, in which you are in good health, have low toxin exposure, and are eating a nutritious diet, your cells can protect against these ROS free radicals. Over the past four decades, research has been continually showing that these damaging free radical by-products of energy production cause many of the fundamental alterations seen in aging and in chronic degenerative disease.

Chapter 2 : Role of Potassium in Maintaining Health | Periodic Paralysis Intl.

Phosphorylation by protein kinase C and the responsiveness of Mg 2+-ATPase to Ca 2+ of myofibrils isolated from stunned and non-stunned porcine myocardium.

This article has been cited by other articles in PMC. Abstract Yoga is an ancient Indian way of life, which includes changes in mental attitude, diet, and the practice of specific techniques such as yoga asanas postures , breathing practices pranayamas , and meditation to attain the highest level of consciousness. Since a decade, there has been a surge in the research on yoga, but we do find very few reviews regarding yogic practices and transcendental meditation TM in health and disease. Keeping this in view, a Medline search was done to review relevant articles in English literature on evaluation of physiological effects of yogic practices and TM. Data were constructed; issues were reviewed and found that there were considerable health benefits, including improved cognition, respiration, reduced cardiovascular risk, body mass index, blood pressure, and diabetes. Yoga also influenced immunity and ameliorated joint disorders. Health, Obesity, Pranayama, Transcendental Meditation, Yoga Introduction Yoga is a psycho-somatic-spiritual discipline for achieving union and harmony between our mind, body, and soul and the ultimate union of our individual consciousness with the universal consciousness. If the attention wanders it is allowed to wander till it returns to the mantra. Data were constructed and issues were reviewed from there. Schools of Yoga Yoga is not only popular in India but also in Western countries. Hatha yoga has become popular in North America in recent years. Hatha yoga includes practice of asanas, pranayamas, and kriyas purification techniques including breathing cleansing techniques and shatkarmasâ€"six groups of purification practices. Around BC, the ancient sage Patanjali evolved the eight stages of yoga which is called as ashtanga yoga. As such, integral yoga incorporates hatha yoga, meditation, and pranayama. In the Indian subcontinent, integral yoga is also known as yoga of transformation. These inhibitory signals coming from cardiorespiratory region involving vagi are believed to synchronize neural elements in the brain leading to changes in the autonomic nervous system; and a resultant condition characterized by reduced metabolism and parasympathetic dominance. The skin resistance increased markedly at the onset of meditation and decreased after meditation but maintained higher than before meditation. Alpha blocking to sound and light was present, and did not show habituation. Based on the EEG findings along with above variables, TM could also be described as a wakeful hypo-metabolic state. Yoga improved the QOL and reduced rescue medication use in bronchial asthma, and achieved the reduction earlier than conventional treatment alone. In contrast, the increase in these parameters in the control group were statistically not significant and demonstrated that yoga training for 6 months improved lung function, strength of inspiratory and expiratory muscles among school children aged 12â€"15 years. It is suggested that yoga be introduced at school level in order to improve physiological functions, overall health, and performance of students. The requirement of insulin in the yoga group was also significantly reduced. The postures performed were: Surya namaskar sun salutation , Trikonasana triangle pose , Tadasana mountain pose , Padmasana lotus pose , Bhastrika Pranayama breathing exercise , Pashimottanasana posterior stretch , Ardhmatsyendrasana half spinal twist , Pawanmuktasana joint freeing series , Bhujangasana cobra pose , Vajrasana thunderbolt pose , Dhanurasana bow pose , and Shavasana corpse pose. At the end of 40 days of performing the asanas, the study participants had a significant decrease in fasting glucose levels, waist-hip ratio and beneficial changes in insulin levels. At the end of the study, the yoga group showed improvements in weight, blood pressure and insulin, when compared with the education group. It is a soothing and nurturing practice that promotes the effects of conscious relaxation [58] has been used to describe a gentle form of yoga which help females with ovarian or breast cancer to reduce depression as well as anxiety state, and better mental health and overall QOL. There was also a decrease in fatigue. The yoga group underwent integrated yoga practices for 35 min daily in the presence of trained yoga teacher for 12 weeks. Control group did not undergo any kind of yoga practice or stress management. Kurmasana tortoise pose which supports the thymus gland could create specific benefits to improve immune function. It also influenced immunity and ameliorated joint disorders. Despite extensive searches, recent research articles in sighting the Physiological basis underlying the effects of yogasanas, pranayamas and TM were limited. Further researches exploring the effects of yoga on different organ systems would be invaluable. Footnotes Conflict of Interest: Effect of 6 wks yoga training on weight loss following step test, respiratory pressures, handgrip strength and handgrip endurance in young healthy subjects. Indian J Physiol Pharmacol. Yoga and its applications. Tandon OP, Tripathi Y, editors. Exploring change in middle-aged women. Yoga and Meditation, Medicine update. The Association of Physicians of India. Long term follow up studies on effect of yoga in diabetes. Diab Res Clin Pract. The Scientific Basis of Yoga Therapy. Biochemical indices associated with meditation practice: Yogic exercises in the management of ischaemic heart disease. 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Chapter 3 : Functions of the Cardiovascular System

The Pfizer, MerckFrosst, Astra, Ciba-Geigy, the Heart and Stroke meeting was entitled 'The Cellular Basis of Cardiovascular Foundation of Manitoba, the Medical Research Council of Function in Health and Disease'.

Its most detrimental effects occur in the nervous system, where lead blocks the receptor know as N-methyl-D-aspartate, an effective receptor involved in the maturation of brain plasticity. The toxicity of lead plays a major role in the communication between astrocytes and endothelial cells. By disrupting the blood-brain barrier, it causes encephalopathy and edema that primarily affects the cerebellum. Intracellularly, lead replaces calcium as a second messenger, binding with calmodulin more readily than calcium, resulting in an alteration in protein conformation. This altered conformation leads protein kinases to phosphoylate and activate substrate molecules, which alter various cellular processes leading to the clinical picture of lead poisoning. However, lead has its most detrimental and serious effects on the central nervous system. In the nervous system, lead blocks the receptor know as N-methyl-D-aspartate, an effective receptor involved in the maturation of brain plasticity, which are changes that occur in brain organization. The blockage of this receptor in the brain leads to the interruption of long-term potentiation, which, in turn, limits the permanent intake and storage of newly learned knowledge. Also, elevated blood lead levels BLLs impair the blood-brain barrier function 1. The blood-brain barrier is made up of many endothelial cells connected by tight junctions. These endothelial cells become surrounded by astrocytes, which actually outnumber neurons in brain; in the process, the astrocytes weave their way in between the axons and dendrites. Studies have shown that the toxicity of lead plays a major role in the communication between the astrocytes and the endothelial cells 1. The blood-brain barrier has a very important function in maintaining the fluid environment of the nervous system. While other organs in the body transport molecules by the simple method of diffusion, the blood-brain barrier is very persnickety in that it selects only certain and essential water-soluble molecules essential amino acids, glucose, calcium, sodium, and potassium to be transported by carriers in the plasma membrane. When the blood-brain barrier is exposed to high levels of lead concentration, plasma moves into the interstitial spaces of the brain, resulting in edema. High blood lead toxicity of the CNS results in encephalopathy and edema that mainly affects the cerebellum of the brain 3. Edema causes extreme pressure increases in the brain, which can lead to irreversible brain damage 4. This type of brain damage includes decreased attention, affects visual-motor reasoning skills and social behavior and can damage mathematic skills and reading abilities 5. This will be discussed further below. Recent studies have shown that even low levels of lead exposure can also affect the renal system. Low BLLs lead to nephropathy of the kidneys as well as hypertension, gout, and future kidney failure 2. Nephropathy of the kidneys exists in three forms, as follows: Lead toxicity also affects the reproductive system in both genders. In males, sperm count is drastically decreased while the abnormal occurrence of sperm increases; in females, lead toxicity can create adverse outcomes in pregnancy. Recent studies also demonstrate that the cardiovascular system is just as affected by acute and chronic levels of lead as any other system in the body. These studies have shown myocardial morphologies, irregular systolic and diastolic numbers, as well as ECG disturbances 2. Second messenger systems usually involve nonsteroid hormones, such as amines proteins, and peptides. The hormone that initially causes a change in the activity of cell membrane proteins is known as a first messenger, and the biochemicals within the cell that cause changes that are the expression of the hormone are known as second messengers 8. Both of these are results of the stimulation of a G-protein. In the case of the former, once a first messenger binds to a binding site, a G-protein, attached to the cell membrane, but facing the inside of the cell, is activated. This G-protein then stimulates the opening of the calcium channel 9. Extracellular calcium then enters the cell and combines with calmodulin, a calcium-binding protein, which affects and stimulates many intracellular functions such as inflammation, metabolism, apoptosis, muscle contraction, intracellular movement, nerve growth and immune response. Lead can interfere with both pathways Lead has a high affinity towards calmodulin and is able to bind to it even at low levels. These observations can be explained, at least in part, by the variations in the ionic radii of the bonds formed by these ions. Lead ions are also more effective than calcium ions in supporting CaM-dependent phosphorylation of brain proteins and the binding of calmodulin to brain proteins. The binding of lead ions at these sites alters protein conformation This is what may cause an altered effect on the activation of protein kinases. Protein kinases transfer phosphate groups from ATP molecules to protein substrate molecules; this phosphorylation alters the shape of the substrate molecules and converts them from inactive to active forms. The activated proteins then alter various cellular processes such as further activating enzymes, altering membrane permeability, promoting synthesis of certain proteins, stimulating or inhibiting metabolic pathways, and initiating secretion of hormones and other substances 8. When protein kinases are inappropriately activatedâ€”as they are when lead binds to calmodulin instead of calciumâ€”any of these cellular processes may be disrupted. According to one study, acute and chronic exposure to lead would predominantly affect two specific protein complexes: These protein complexes are deeply involved in learning and cognitive functions and are also thought to interact significantly with each other to mediate these functions A study of lead and calcium uptake in bovine adrenal medullary cells has revealed ways in which lead serves to alter the function of calcium. The depolarization of a cell membrane, caused by the G-protein, opens calcium channels. Lead inhibits calcium entry, and the depolarization also stimulates lead entry. The channel has an extremely high permeability for lead ions, in the range of about ten times that of its permeability for calcium ions. Normally, these channels readily close after calcium passes through due to an internal effect of the calcium ions. However, with lead, the channels do not inactivate because of the absence of this internal effect Once lead is in the cytoplasm of the cell, the above abnormal processes may proceed see Figure 2. During the in utero period, the fetus is at an increased susceptibility to toxins and disease since it is in the process of developing, and is therefore unable to adequately protect itself. Although there may not be an immediate presentation of these symptoms, it is believed that a child who has been subject to lead exposure in utero will most likely develop severe malfunctions in their central nervous system sometime in the future The mechanism for this transport of lead, however, is not clearly known. There have been strong correlations between mother blood level and cord blood levels, as well as a linear relationship between the transfer of lead and umbilical cord blood flow rate. Both of these findings indicate that lead transport via the placenta may be a simple case of diffusion. An alternate proposal, however, is that lead in fetal tissue may be affected by calcium transport and intracellular calcium metabolism One of the main components of the CNS, the brain, is at an especially high risk of susceptibility to lead toxicity during in utero. During , the blood-brain barrier begins its development and continues to develop until approximately six weeks after birth Thus, lead exposure in utero is especially dangerous since the blood-brain barrier is not fully developed and offers little protection for the brain. Furthermore, there has been experimental evidence that suggests that the fetal brain offers low resistance to lead toxicity because it lacks lead-protein complexes in astryocytes that remove lead from the mitochondria. Lead toxicity during this developmental period has often been associated with cognitive impairment and learning malfunctions, as lead can accumulate in their nervous systems as they develop. NMDA receptors are amino acid receptors that play an important role in brain development and synaptic plasticity, especially in regards to the long-term potentiation of the hippocampus Lead exposure during the developmental years and its inhibition of NMDA receptors has been attributed to a decrease in IQ that ranges with varying blood lead levels 6, 22, The most widely studied effect of lead poisoning is the damage it does to cognitive abilities. The IQ loss is permanent, as the relationship held true after ten years with a group of 2 year olds The children usually lose about IQ points. The loss of cognitive ability is associated with shortened attention span and antisocial behavior. In order for the effects to become permanent, the child must be exposed to unsafe levels of lead while they are under two years old, after which the effects appear to be reversible 2. Although it is more common to see lead poisoning in children, adults are not immune from such damage A very high risk is associated with women of childbearing age who possess high levels of lead in their bodies before pregnancy. This lead eventually affects the fetus through the placenta, which connects the mother and the fetus, and has the potential to cause fetal brain damage or even death of the fetus see Figure 3 In other adults, exposure to lead manifests itself with numerous problems, including high blood pressure, fertility and digestive problems and muscle and joint pain. Lead affects the nervous system of adults in ways similar to its affect on that of children, leading to problems with memory and concentration Thus, although lead poisoning in adults has been of little concern in the past, it is imperative that adults take precautions in order to avoid the harm that lead inflicts upon systems of the adult body. Lead poisoning can also present clinically in adults or children in anemia. Lead can affect the formation of heme, causing microcytic anemia. Lead bonds with the sulfhydryl group of proteins, causing impaired function. Delta-aminolevulinic acid dehydratase, which catalyzes the formation of the porphobilinogen ring, and ferrochelatase are both impaired by lead. Low lead levels have been connected to kidney decline in renal function. It has been hypothesized that the lack of enzymes with heme may disrupt energy metabolism see Figure 4 for further clinical presentation 2. Sources of Lead Exposure We have seen the effects of lead clinically and on cells, but it also important to consider how humans are exposed to lead. Lead poisoning comes from a variety of different sources. Prior to , a major source was lead solder in the joints of canned food. Lead solder is no longer used in the U. Currently, the primary source of lead ingestion is from lead in paint. Lead poisoning can also come from drinking water. The water may be contaminated at the source from the environment, or in the pipes that carry the water, which can be made of lead, or have lead components. Various regulations have reduced the amount of lead used in industry. Now, paint cannot contain more than. Preventing Lead Poisoning We have seen that exposure to lead can severely impair cellular function in people of all ages. However, that is not to say that such exposure cannot be avoided. Studies have been conducted to document the damage caused by exposure to high levels of lead, leading to numerous guidelines and lists of protective measures one can take to avoid such damage. The United States Environmental Protection Agency, for example, clearly outlines how to check if one is at increased risk for lead exposure and what steps to take to limit exposure to lead. All of these interactions with lead give rise to increased levels of lead in the body, which as previously mentioned, causes serious health problems, especially in children. It is important for people to consider that the older their homes are, the more likely they are to contain lead-based paint, since the federal government did not ban the use of such paint until It is key to hire trained and certified professionals to conduct these inspections However, one does not need to be a trained professional to take daily measures to prevent lead poisoning. The EPA recommends notifying a landlord immediately if you suspect deteriorating paint in your rented home or apartment. It also suggests cleaning surfaces such as floors and windowsills weekly and carefully cleaning the cleaning utensils used

Chapter 4 : Diabetes Pathophysiology

The meeting was entitled The Cellular Basis of Cardiovascular Function in Health and Disease. There were over 40 invited speakers from 15 different countries represented at the meeting, attended by over people.

A lack of magnesium will impede your cellular metabolic function and deteriorate mitochondrial function , which in turn can lead to more serious health problems. Unfortunately, magnesium insufficiency or deficiency are extremely common around the world. The most likely reason for this is because they do not eat fresh vegetables on a regular basis. Magnesium resides at the center of the chlorophyll molecule. Moreover, some researchers insist the RDA is inadequate, warning that many suffer from subclinical magnesium deficiency that can compromise their cardiovascular health. Adding to the problem is that a regular serum magnesium is a poor test, as only 1 percent of the magnesium in your body is actually found in your bloodstream. Magnesium deficiency raises your risk of many chronic ailments and premature death Your best bet is to have an RBC magnesium test done, which measures the amount of magnesium in your red blood cells. Alternatively, keep an eye on your potassium and calcium levels, as low potassium and calcium are common laboratory signs of magnesium deficiency. Most soils have become severely depleted of nutrients, including magnesium, which is why some experts believe most people need supplemental magnesium. If you frequently eat processed foods, your risk of deficiency is magnified. As noted in a paper: Furthermore, it is hindered by excess fat. On the other hand, Mg levels are decreased by excess ethanol, salt, phosphoric acid sodas and coffee intake, by profuse sweating, by intense, prolonged stress, by excessive menstruation and vaginal flux, by diuretics and other drugs and by certain parasites pinworms. Experience symptoms of insufficiency or deficiency Have hypertension Engage in strenuous exercise on a regular basis. Creation of adenosine triphosphate ATP , the energy currency of your body Metabolism of calcium, potassium, zinc, phosphorus, iron, sodium, hydrochloric acid, acetylcholine and nitric oxide, as well as enzymes, and the activation of thiamine. For a more exhaustive list of signs and symptoms, see Dr. This will also help you gauge how much magnesium you need to resolve your deficiency symptoms. To check for this sign, a blood pressure cuff is inflated around your arm. The pressure should be greater than your systolic blood pressure and maintained for three minutes. By occluding the brachial artery in your arm, spasms in your hand and forearm muscles are induced. If you are magnesium-deficient, the lack of blood flow will cause your wrist and metacarpophalangeal joint to flex and your fingers to adduct. When magnesium intake is low, your body compensates, trying to maintain a normal serum magnesium level by pulling the mineral from your bones, muscles and internal organs. Common pathologies associated with magnesium deficiency include but are not limited to: Estimates suggest nearly half of all diabetics are magnesium deficient. Low magnesium levels also affect insulin resistance, a precursor to Type 2 diabetes. According to the authors: While the analysis was based on observational studies and did not prove a direct link, the researchers noted the results support the theory that increasing your magnesium intake may provide overall health benefits. Magnesium-Rich Foods While you may still need magnesium supplementation due to denatured soils , it would certainly be wise to try to get as much magnesium from your diet as possible. Greens with the highest magnesium levels include:

Chapter 5 : Physiological Effects of Yogic Practices and Transcendental Meditation in Health and Disease

The Cellular Basis of Cardiovascular Function in Health and Disease by Pawan K. Singal, , available at Book Depository with free delivery worldwide.

References If insulin production and secretion are altered by disease, blood glucose dynamics will also change. If insulin production is decreased, glucose entry into cells will be inhibited, resulting in hyperglycemia. The same effect will be seen if insulin is secreted from the pancreas but is not used properly by target cells. If insulin secretion is increased, blood glucose levels may become very low hypoglycemia as large amounts of glucose enter tissue cells and little remains in the bloodstream. Following meals, the amount of glucose available from carbohydrate breakdown often exceeds the cellular need for glucose. Excess glucose is stored in the liver in the form of glycogen, which serves as a ready reservoir for future use. When energy is required, glycogen stores in the liver are converted into glucose via glycogenolysis, elevating blood glucose levels and providing the needed cellular energy source. The liver also produces glucose from fat fatty acids and proteins amino acids through the process of gluconeogenesis. Glycogenolysis and gluconeogenesis both serve to increase blood glucose levels. Thus, glycemia is controlled by a complex interaction between the gastrointestinal tract, the pancreas, and the liver. Multiple hormones may affect glycemia. Insulin is the only hormone that lowers blood glucose levels. The counter-regulatory hormones such as glucagon, catecholamines, growth hormone, thyroid hormone, and glucocorticoids all act to increase blood glucose levels, in addition to their other effects. Type 1 Diabetes The underlying pathophysiologic defect in type 1 diabetes is an autoimmune destruction of pancreatic beta cells. Following this destruction, the individual has an absolute insulin deficiency and no longer produces insulin. Autoimmune beta cell destruction is thought to be triggered by an environmental event, such as a viral infection. Genetically determined susceptibility factors increase the risk of such autoimmune phenomena. The onset of type 1 diabetes is usually abrupt. It generally occurs before the age of 30 years, but may be diagnosed at any age. Most type 1 diabetic individuals are of normal weight or are thin in stature. Since the pancreas no longer produces insulin, a type 1 diabetes patient is absolutely dependent on exogenously administered insulin for survival. People with type 1 diabetes are highly susceptible to diabetic ketoacidosis. Because the pancreas produces no insulin, glucose cannot enter cells and remains in the bloodstream. To meet cellular energy needs, fat is broken down through lipolysis, releasing glycerol and free fatty acids. Glycerol is converted to glucose for cellular use. Fatty acids are converted to ketones, resulting in increased ketone levels in body fluids and decreased hydrogen ion concentration pH. Ketones are excreted in the urine, accompanied by large amounts of water. The accumulation of ketones in body fluids, decreased pH, electrolyte loss and dehydration from excessive urination, and alterations in the bicarbonate buffer system result in diabetic ketoacidosis DKA. Untreated DKA can result in coma or death. Spontaneous hypoglycemia in adults is of two principal types: Diabetes Complications The major cause of the high morbidity and mortality rate associated with Chronic Complications of Diabetes Late clinical manifestations of diabetes mellitus include a number of pathologic changes Diabetes Cardiovascular complications Cardiovascular disease risk is increased in patients with type 1 diabetes Complications of Insulin Therapy Hypoglycemic reactions, the most common complication of insulin therapy Diabetic Nephropathy As many as cases of end-stage renal disease occur each year among diabetic people in the United States Diabetic Neuropathy Diabetic neuropathies are the most common complications of diabetes affecting Primary treatment goals for diabetes patients include the achieving of blood glucose levels Many patients with type 1 diabetes are initially diagnosed with the disease following a hospital admission for DKA. In a known diabetic patient, periods of stress or infection may precipitate DKA. More often, however, DKA results from poor daily glycemic control. Patients who remain severely hyperglycemic for several days or longer due to inadequate insulin administration or excessive glucose intake are prone to developing DKA. Most type 2 diabetes patients are overweight, and most are diagnosed as adults. The genetic influence in type 2 diabetes is greater than that seen with type 1. Although the genetic predisposition to type 2 diabetes is strong, no single genetic defect has been found. In addition to genetic influences, acquired risk factors for type 2 diabetes include obesity, advancing age, and an inactive lifestyle. The underlying pathophysiologic defect in type 2 diabetes does not involve autoimmune beta-cell destruction. Rather, type 2 diabetes is characterized by the following three disorders: Increased tissue resistance to insulin generally occurs first and is eventually followed by impaired insulin secretion. The pancreas produces insulin, yet insulin resistance prevents its proper use at the cellular level. Glucose cannot enter target cells and accumulates in the bloodstream, resulting in hyperglycemia. The high blood glucose levels often stimulate an increase in insulin production by the pancreas; thus, type 2 diabetic individuals often have excessive insulin production hyperinsulinemia. Over the years, pancreatic insulin production usually decreases to below normal levels. In addition to hyperglycemia, type 2 diabetic patients often have a group of disorders that has been called "insulin resistance syndrome" or syndrome X. Obesity contributes greatly to insulin resistance, even in the absence of diabetes. In fact, weight loss is a cornerstone of therapy for obese type 2 diabetic patients. Insulin resistance generally decreases with weight loss. Obesity also may explain the dramatic increase in the incidence of type 2 diabetes among young individuals in the United States in the past 10 to 20 years. Type 2 diabetes usually has a slow onset and may remain undiagnosed for years. Approximately half of those who have type 2 diabetes are unaware of their disease. Unfortunately, the insidious nature of the disease allows prolonged periods of hyperglycemia to begin exerting negative effects on major organ systems. By the time many type 2 diabetic patients are diagnosed, diabetic complications have already begun. Type 2 diabetic patients do not require exogenous insulin for survival since they still produce insulin. However, insulin injection is often an integral part of medical management for type 2 diabetes. Unlike type 1 diabetic patients, individuals with type 2 diabetes are generally resistant to DKA because their pancreatic insulin production is often sufficient to prevent ketone formation. Severe physiologic stress may induce DKA in those with type 2 diabetes. Long periods of severe hyperglycemia may result in hyperosmolar nonketotic acidosis. Hyperglycemia results in the urinary excretion of large amounts of glucose, with attendant water loss. If fluids are not replaced, the dehydration can result in electrolyte imbalance and acidosis. It usually develops during the third trimester and significantly increases perinatal morbidity and mortality. As with type 2 diabetes, the pathophysiology of gestational diabetes is associated with increased insulin resistance. People with IFG have increased fasting blood glucose levels but usually have normal levels following food consumption. Those with IGT are normoglycemic most of the time but can become hyperglycemic after large glucose loads. IGT and IFG are not considered to be clinical entities; rather, they are risk factors for future diabetes. The pathophysiology of IFG and IGT is related primarily to increased insulin resistance whereas endogenous insulin secretion is normal in most patients.

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Potassium is a very significant body mineral, important to both cellular and electrical function. It is one of the main blood minerals called "electrolytes" the others are sodium and chloride , which means it carries a tiny electrical charge potential. Potassium is the primary positive ion cation found within the cells, where 98 percent of the grams of potassium contained in the body is found. The blood serum contains about mg. Magnesium helps maintain the potassium in the cells, but the sodium and potassium balance is as finely tuned as those of calcium and phosphorus or calcium and magnesium. Research has found that a high-sodium diet with low potassium intake influences vascular volume and tends to elevate the blood pressure. Then doctors may prescribe diuretics that can cause even more potassium loss, aggravating the underlying problems. The appropriate course is to shift to natural, potassium foods and away from high-salt foods, lose weight if needed, and follow an exercise program to improve cardiovascular tone and physical stamina. The natural diet high in fruits, vegetables, and whole grains is rich in potassium and low in sodium, helping to maintain normal blood pressure and sometimes lowering elevated blood pressure. The body contains more potassium than sodium, about nine ounces to four, but the American diet, with its reliance on fast foods, packaged convenience foods, chips, and salt has become high in sodium salt. Potassium is well absorbed from the small intestine, with about 90 percent absorption, but is one of the most soluble minerals, so it is easily lost in cooking and processing foods. Most excess potassium is eliminated in the urine; some is eliminated in the sweat. When we perspire a great deal, we should replace our fluids with orange juice or vegetable juice containing potassium rather than just taking salt tablets. The kidneys are the chief regulators of our body potassium, keeping the blood levels steady even with wide variation in intake. The adrenal hormone aldosterone stimulates elimination of potassium by the kidneys. Alcohol, coffee and caffeine drinks , sugar, and diuretic drugs, however, cause potassium losses and can contribute to lowering the blood potassium. This mineral is also lost with vomiting and diarrhea. Potassium is found in a wide range of foods. Many fruits and vegetables are high in potassium and low in sodium and, as discussed, help prevent hypertension. Most of the potassium is lost when processing or canning foods, while less is lost from frozen fruits or vegetables. Leafy green vegetables such as spinach, parsley, and lettuce, as well as broccoli, peas, lima beans, tomatoes, and potatoes, especially the skins, all have significant levels of potassium. Fruits that contain this mineral include oranges and other citrus fruits, bananas, apples, avocados, raisins, and apricots, particularly dried. Whole grains, wheat germ, seeds, and nuts are high-potassium foods. Fish such as flounder, salmon, sardines, and cod are rich in potassium, and many meat foods contain even more potassium than sodium, although they often have additional sodium added as salt. Potassium may also be obtained from the following herbs: Caffeine and tobacco reduce the absorption of potassium. People at risk for insufficient potassium intake include alcoholics, drug addicts and crash dieters. Potassium is very important in the human body. Along with sodium, it regulates the water balance and the acid-base balance in the blood and tissues. Potassium enters the cell more readily than does sodium and instigates the brief sodium-potassium exchange across the cell membranes. In the nerve cells, this sodium-potassium flux generates the electrical potential that aids the conduction of nerve impulses. When potassium leaves the cell, it changes the membrane potential and allows the nerve impulse to progress. This electrical potential gradient, created by the "sodium-potassium pump," helps generate muscle contractions and regulates the heartbeat. If sodium is not pumped out, water accumulates within the cell causing it to swell and ultimately burst. Potassium is very important in cellular biochemical reactions and energy metabolism; it participates in the synthesis of protein from amino acids in the cell. Potassium also functions in carbohydrate metabolism; it is active in glycogen and glucose metabolism, converting glucose to glycogen that can be stored in the liver for future energy. Potassium is important for normal growth and for building muscle. Though sodium is readily conserved by the body, there is no effective method for potassium conservation. Even when a potassium shortage exists, the kidneys continue to excrete it. In medicine, potassium is one of the most commonly prescribed minerals. It is also commonly measured in biochemical testing and is supplemented if it is low. Because potassium is crucial to cardiovascular and nerve functions and is lost in diuretic therapy for edema or hypertension, a prevalent American disease, it must be added as a dietary supplement frequently. As stated before, the average American diet has reversed the natural high potassium-low sodium intake, and a shift back to this more healthful balance will help reduce some types of elevated blood pressure. Supplementing potassium can be helpful in treating hypertension specifically caused by a hyper-response to excess sodium. In one study, 37 adults with mild hypertension participated in a crossover study. Patients received either 2. They were then crossed-over to receive a different treatment for another eight weeks and so on. The results of the study demonstrated that potassium supplementation lowered systolic blood pressure from an average of 12 mm Hg and diastolic blood pressure an average of 16 mm Hg. Interestingly, the additional magnesium offered no further reduction in blood pressure. Potassium supplementation may be especially useful in the treatment of high blood pressure in persons over the age of The elderly often do not fully respond to blood pressure-lowering drugs making the use of potassium supplement an exciting possibility. After this relatively short treatment period the group getting the potassium experienced a drop of 12 mm Hg in systolic and 7 mm Hg in diastolic blood pressure. These results compare quite favorably to the reduction of blood pressure produced by drug therapy in the European Working Party on High Blood Pressure in Elderly Study. Pharmacological preparations of potassium are commonly prescribed for many of these conditions. A 10 percent potassium chloride solution is often given, but its taste is unpleasant. More easily used formulas are tablets that are swallowed or effervescent tablets. Time-release formulas such as Micro-K are also available. Potassium chloride has occasionally been helpful in treating infant colic, some cases of allergies, and headaches. During and after diarrhea, potassium replacement may be necessary, and many people feel better taking potassium during weight-loss programs. Fatigue or weakness, especially in the elderly, is often alleviated with supplemental potassium, along with magnesium. Additional potassium may also be required for dehydration states after fluid losses and may be used to prevent or reduce hangover symptoms after alcohol consumption. Elevations or depletions of this important mineral can cause problems and, in the extreme, even death. Maintaining consistent levels of potassium in the blood and cells is vital to body function. Even with high intakes of potassium, the kidneys will clear any excess, and blood levels will not be increased. For elevated potassium levels, called hyperkalemia, to occur, there must usually be other factors involved; decrease in renal function is the most likely cause. Major infection, gastrointestinal bleeding, and rapid protein breakdown also may cause elevated potassium levels. Cardiac function is affected by hyperkalemia; electrocardiogram changes can be seen in this condition. Deficiency of potassium is much more common, especially with aging or chronic disease. Some common problems that have been associated with low potassium levels include hypertension, congestive heart failure, cardiac arrhythmia, fatigue, and depression and other mood changes. Many factors reduce body levels of potassium. Diarrhea, vomiting, and other gastrointestinal problems may rapidly reduce potassium. Infants with diarrhea must be watched closely for low blood potassium, termed hypokalemia. Diabetes and renal disease may cause low as well as high potassium levels. Several drugs can cause hypokalemia-diuretic therapy is of most concern; long-term use of laxatives, aspirin, digitalis, and cortisone may also deplete potassium. Heat waves and profuse sweating can cause potassium loss and lead to dehydration, with potassium leaving the cells along with sodium and being lost in the urine. This can generate some of the symptoms associated with low potassium; most people are helped rapidly with potassium supplements or potassium-rich foods. People who consume excess sodium can lose extra urinary potassium, and people who eat lots of sugar also may become low in potassium. Fatigue is the most common symptom of chronic potassium deficiency. Early symptoms include muscle weakness, slow reflexes, and dry skin or acne; these initial problems may progress to nervous disorders, insomnia, slow or irregular heartbeat, and loss of gastrointestinal tone. A sudden loss of potassium may lead to cardiac arrhythmia Low potassium may impair glucose metabolism and lead to elevated blood sugar. In more severe potassium deficiency, there can be serious muscle weakness, bone fragility, central nervous system changes, decreased heart rate, and even death. Potassium is the most commonly measured blood mineral in medicine, and deficiencies must be watched for carefully and treated without delay with supplemental potassium. There is no specific RDA for potassium, though it is thought that at least The average American diet includes from grams per day. In cooking or canning foods, potassium is depleted but sodium is increased, as it is in most American processed foods as well. It is suggested that we include more potassium than sodium in our diets; a ratio of about 2: When we increase sodium intake, we should also consume more potassium-rich foods or take a potassium supplement. Prescribed potassium replacement Over-the-counter potassium supplements usually contain 99 mg. Prescription potassium is usually measured in milliequivalents mEq. The inorganic potassium salts are found as the sulfate, chloride, oxide, or carbonate. Organic salts are potassium gluconate, fumarate, or citrate. These organic molecules are normally part of our cells and body tissues. Potassium liquids and salt substitutes containing potassium chloride KCl are other ways to obtain additional sources of this mineral. Potassium is well absorbed, so it is available to the body in most forms. Copyright Elson M.