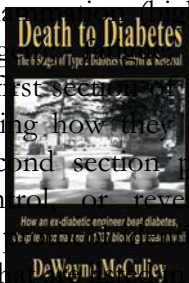


Chapter 15. Diabetic Complications



Diabetic Complications

There are several long-term microvascular and macrovascular complications that develop if your diabetes is not managed properly and your blood glucose is not maintained within the normal range. They are kidney disease, eye disease, nerve disease, and heart disease. Other health complications that can occur before or after you become diabetic include: high blood pressure; high inflammation (including high homocysteine, C-reactive protein, cholesterol, fibrinogen, and ferritin), and frequent infections (especially gum disease). The first section of this chapter describes these diabetic complications, including how they develop and how they are medically diagnosed. The second section provides a set of wellness protocols that prevent, control, or reverse the effects of these complications. Each wellness protocol identifies and describes a list of specific (*food-based*) nutrients that are used in the protocol in alphabetical order.



KEY MESSAGE: If you control your blood glucose level and hemoglobin A1C within their normal ranges, you will not develop these long-term complications because of your diabetes. Otherwise, at least 4 out of every 5 diabetics will develop one or more of these complications.

WARNING! Although the nutritional supplements listed in this chapter can be beneficial to your health, some of them may conflict with your current drug therapy. Consequently, *always* review your nutritional supplementation strategy with your doctor to prevent any life-threatening health complications.

Kidney Disease (Nephropathy)

Diabetic nephropathy occurs when there is too much inflammation and glucose in the bloodstream, clogging the small capillaries that feed into the kidneys. In addition, there is an excess amount of acid waste in the blood that further clogs these small capillaries. The accumulation of calcium (due to the extra insulin) and acid waste in the kidneys causes the formation of kidney stones and ultimately causes kidney cells to die. Because kidney cells cannot be regenerated or repaired, the remaining cells have to work that much harder to filter substances from the blood. To help with the filtering process, the heart increases the flow of blood plasma to the kidneys, which in turn elevates blood pressure. As the kidney cells continue to die, the risk of kidney failure increases dramatically. This eventually leads to one or both of the kidneys losing their ability to function properly, characterized by high protein levels in the urine. Alcohol, tobacco, and animal meat, and many of the other “dead” processed foods accelerate the deterioration of the kidneys.

Each kidney is comprised of more than a million units called nephrons. Each nephron has a tuft of blood vessels called a glomerulus. The glomerulus filters blood into a tube called a nephron, which drains down into collecting ducts to the ureters. A detectable change in the course of diabetic nephropathy is a thickening in the glomerulus. At this stage, the kidney may start allowing more albumin (protein) than normal in the urine, and this can be detected by sensitive tests for albumin. This stage is called “microalbuminuria” (micro refers to the small amounts of albumin). As diabetic nephropathy progresses, increasing numbers of glomeruli are destroyed. This increases the amounts of albumin being excreted in the urine, and may be detected by ordinary urinalysis techniques. At this stage, a kidney biopsy clearly shows diabetic nephropathy.

Protein may appear in the urine for five to ten years before other symptoms develop. High blood pressure often accompanies diabetic nephropathy. Over time, the kidney’s ability to function starts to decline.

Diabetic nephropathy may eventually lead to chronic kidney failure. The disorder continues to progress toward end-stage kidney disease, usually within two to six years after the appearance of high protein in the urine (proteinuria).

Diabetic nephropathy is the most common cause of chronic kidney failure and end-stage kidney disease in the United States. People with both Type 1 and Type 2 diabetes are at risk. The risk is higher if blood glucose levels are poorly controlled. However, once nephropathy develops, the greatest rate of progression is seen in patients with high blood pressure.

Diabetic nephropathy is generally accompanied by other diabetic complications including high blood pressure, retinopathy, and vascular (blood vessel) changes, although these may not be obvious during the early stages of nephropathy. Nephropathy may be present for many years before high protein in the urine and kidney failure develops.

Diagnosis & Tests

The first laboratory abnormality is a positive microalbuminuria test, which implies that you are very likely to develop diabetic nephropathy. Most often, the diagnosis is suspected in a routine urinalysis of a person with diabetes shows too much protein in the urine (proteinuria). The urinalysis may also show glucose in the urine, especially if blood glucose is poorly controlled.

There may or may not be signs of other diabetic complications. High blood pressure may be present or develop rapidly and may be difficult to control. Serum creatinine and BUN (blood urea nitrogen) may increase as kidney damage progresses. If there is any doubt in the diagnosis, a kidney biopsy may be performed to confirm the diagnosis and to study the extent of the disease.

Foods and nutrients such as filtered water, celery, cucumbers, lemons, limes, and cranberries nourish, protect and cleanse the kidneys and the bladder. Refer to the wellness protocol section in this chapter for more details.



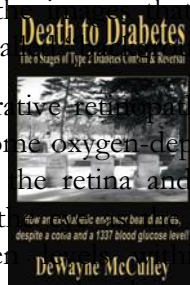
Eye Disease (Retinopathy)

After the kidneys, the eyes are usually the second major organ that is damaged by the effects of diabetes. The signs of damage to the eyes include blurry vision, spots, and loss of vision, which can lead to blindness if the macula is damaged and there is a loss of blood supply to the retina.

The retina is a nerve layer at the back of the eye that senses light and helps send images to the brain, similar to film in a camera. Diabetic retinopathy is caused by damage to blood vessels of the retina, leading to the loss of vision and even blindness. In the initial stages (called non-proliferative diabetic retinopathy), the arteries in the retina become weakened and leak fluid or blood, forming small, dot-like hemorrhages. This can blur or distort the images that the retina sends to the brain leading to blurred vision, called "background and retinopathy".

In the next stage (proliferative retinopathy), circulation problems cause areas of the retina to become oxygen-deprived or ischemic. New, fragile blood vessels develop in the retina and branch out into the vitreous humor in the middle of the eye. The body's circulatory system attempts to maintain adequate oxygen levels in the retina. This is called neovascularization. Unfortunately, these blood vessels are fragile and hemorrhage easily, causing blood to leak into the retina and vitreous. This creates spots or floaters, causing a decrease in vision and scarring. In the later stages of the disease, continued abnormal blood vessel growth and scar tissue cause serious problems such as retinal detachment and glaucoma.

The likelihood and severity of retinopathy increase with the duration of diabetes and is likely to be worse if blood glucose is poorly controlled. Almost all people who have had diabetes for more than 30 years will show signs of diabetic retinopathy, as it is the *leading cause of blindness* in working-age Americans.



Diagnosis & Tests

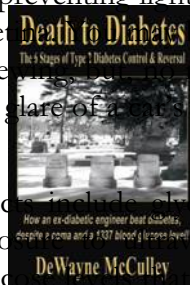
The diagnosis of diabetic retinopathy is made following a detailed examination of the retina with an ophthalmoscope. Ophthalmoscopy is an examination of the back part of the eyeball (fundus), which includes the retina, optic disc, choroid, and blood vessels. Ophthalmoscopy is performed as part of a routine physical or complete eye examination to detect and evaluate symptoms of retinal detachment and eye diseases such as glaucoma and cataracts. Most patients with diabetic retinopathy are referred to vitreo-retinal surgeons who specialize in treating this disease.

Cataracts & Glaucoma

Diabetics are twice as likely to develop eye diseases such as cataract and glaucoma. A cataract is a clouding or opaque area that develops over the lens of the eye, and thickens, preventing light rays from passing through the lens and focusing on the retina. You may have a cataract if you need a stronger light for reading or see halos around lights. No matter how bright the light, your vision seems dim; or, the glare of a car's headlights makes it difficult to see.

The primary causes of cataracts are glycosylation and oxidation -- due to the accumulated exposure to ultraviolet light, tobacco, or diabetes with uncontrolled glucose. Glycosylation and oxidation damage the proteins in the eye lens. Consequently, one of the key strategies to either slow down or even prevent the formation of a cataract is to reduce the amount of glycosylation and oxidation – by wearing sunglasses and eating foods and supplements that contain antioxidants, e.g. spinach, red grapes, carrots, bilberry, beta carotene, Vitamin C, l-carnosine. Studies continue to show that people with cataracts tend to have low serum levels of beta carotene and Vitamin C. These nutrients will not cure cataracts, but they will prevent further damage. Even after someone has had cataract surgery, he/she will still need to consider antioxidant nutrients, otherwise, the new lens will become cloudy from the same oxidative process.

Glaucoma is an increase in fluid pressure inside the eye that leads to optic nerve damage and loss of vision. Glaucoma is called the “sneak thief” of sight because it has no obvious signs at first – it is painless and has no



effect on vision. By the time you notice that your vision has deteriorated, glaucoma has done its damage. Consequently, **annual exams are a must, especially if glaucoma runs in your family.**

A normal eye is filled with fluid, which drains through tissue between the iris and the cornea. With glaucoma, the draining of the fluid slows down or stops completely as the eyes' "drainage pipes" become backed up like a clogged drain. The backup of the fluid builds intraocular pressure throughout the eye, damaging blood vessels that feed the retina and optic nerve. Without the proper nutrients, the optic nerve begins to die, and so does your vision.

It is important to note that many people with glaucoma don't realize there is a loss of vision because they don't actually "see" dark areas – there are no visible "walls" of the so-called "tunnel". People with peripheral vision loss just see a narrower visual field. People with normal vision see images all around them and have a naturally limited range of vision. They do not "see" darkness either – they just see less of their surroundings. This is why annual eye exams are so important – they can catch the glaucoma before any irreversible damage is done.



Once your doctor diagnoses glaucoma, eye drop medication will be necessary to reduce the eye pressure and prevent any further loss of vision. High doses of supplements such as natural Vitamin C with bioflavonoids (1000 to 2000 mg) and bilberry/eyebright (350 to 500 mg) may help to draw fluid out of the eye, but this has not been completely verified with any well-controlled clinical studies. Refer to the wellness protocol section in this chapter for more details.

Nerve Disease (Neuropathy)

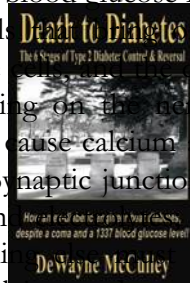
About 15 million Americans suffer from neuropathy, a nerve problem that can damage the nervous system and cause unrelenting aches and pains. In particular, 60% of diabetics develop peripheral neuropathy when their blood glucose reaches and remains at dangerous levels for several years. When blood glucose levels rise too high and remain too high, the glucose molecule attaches itself to cells permanently and is

eventually converted to a poison sugar called sorbitol that destroys nerve cells (nerve death). The signs of nerve damage include tingling, burning, and the loss of feeling (touch) in the feet, which lead to a high incidence of foot infections, foot ulcers, and amputations. If motor or autonomic nerves are damaged, this can lead to the loss of muscle control, bladder control, and bowel control. Eventually, after many years of poor blood glucose control and deterioration of the nervous system, the cells in the brain may also become damaged.

Peripheral Neuropathy

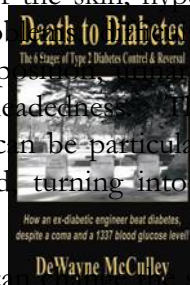
The peripheral nerves that go to the arms, hands, legs, and feet are responsible for relaying information from the central nervous system (brain and spinal cord) to muscles and other organs. Peripheral nerves also relay information back to the spinal cord and brain from the skin, joints, and other organs. High blood glucose levels create trace chemicals that damage the blood vessels, reduce oxygen to some nerves and cause oxidative stress to nerve fibers and the myelin sheath covering them. In addition, the high glucose and insulin levels can cause calcium and other minerals to leech from the synaptic junctions. Synaptic junctions can only retain a limited amount of glucose, insulin, and other chemicals. Therefore, when glucose or excess insulin enters, something must be released. Since there is usually a plentiful supply of calcium and potassium from food, as well as a plentiful supply of oxygen from the lungs, these elements are generally the first to be discharged. However, once the nerve cell becomes shorter, it remains in that condition until it is over stimulated.

The calcium ion pump is responsible for the propagation of the nerve impulse along the myelin sheath. As a result, each time the synaptic junctions and nerve cells lose calcium, they conduct fewer impulses. A similar process is facilitated by the electric fields of tiny electrical charges, which are keyed to potassium levels. Atrophy occurs when any body part is used with less and less frequency. Similarly, when the electrical signals are not propagating correctly and the body assumes that the nerve is no longer necessary and, to conserve energy, further reduces support for that nerve cell. In turn the nerve cell shrinks in order to function due to a reduced input of fuel and oxygen while still keeping itself viable until the



nerve ceases to function. Consequently untreated diabetes, hypoglycemia or poor glucose control could cause wide variations in the blood calcium, potassium, sugar, insulin, and oxygen levels thereby resulting in oxygen deprivation and loss of nerve integrity. Damaged nerves stop sending messages or send messages too slowly or at the wrong times. This leads to neuropathic symptoms such as tingling or numbness in the feet.

As a result, damage to these peripheral nerves can make the arms, hands, legs, or feet feel numb. Also, you might not be able to feel pain, heat, or cold when you should. You may feel shooting pains, burning or tingling like “pins and needles”. These feelings are often worse at night and make it difficult to sleep. Most of the time these feelings are on both sides of your body, like in both of your feet, but they can be on just one side. Some of the other symptoms of peripheral neuropathy include prickly or burning pains, tightness of the skin, hypersensitivity to touch, impaired coordination, balance problems, difficulty climbing stairs or difficulty getting up from a sitting position, urinary urgency, erectile dysfunction, acid reflux and lightheadedness. The numbness that typically accompanies neuropathy can be particularly problematic because minor injuries may go unnoticed, turning into health problems that are not minor at all.



Peripheral nerve damage causes a change in the shape of your feet because foot muscles get weak and the tendons in the foot get shorter. In some cases, failure of nerves controlling blood vessels, intestinal function, and other organs results in abnormal blood pressure, digestion, and loss of other basic involuntary processes. Peripheral neuropathy may involve damage to a single nerve or nerve group (mononeuropathy) or may affect multiple nerves (polyneuropathy).

Damage to Autonomic Nervous System & Brain

After a period of years, diabetes can damage the nerves of the autonomic nervous system, and eventually, even affect the nerve cells of the brain. Damage to the autonomic nervous system causes one or more of the following:

- Difficulty in feeling the symptoms of hypoglycemia (low blood sugar).

- Nausea, vomiting, constipation, or diarrhea due to damage to the autonomic nerves that go to the stomach, intestines, and other parts of the digestive system, making food pass through the digestive system too slowly or too quickly.
- Erectile dysfunction or impotence due to the damage to the autonomic nerves going to the man's penis nerves.
- Prevention of a woman's vagina from getting wet when she wants to have sex or having less feeling around her vagina.
- A faster beating of the heart or the heart beating at different speeds.
- Difficulty in knowing when to go to the bathroom due to damage to the autonomic nerves that go to the bladder. The damage can also make it hard to feel when your bladder is empty. Both problems can cause you to hold urine for too long, which can lead to bladder infections.
- Slow movement of your blood when you change position. When you go from lying down to standing up or when you exercise a lot, the sudden changes in blood pressure can make you dizzy.
- Double vision due to damage to the autonomic nerves going to the cranial nerves that control the eyes. Damage to these nerves usually happens in one eye and usually lasts for a short time.
- A side of the face hangs lower or sags due to damage to the autonomic nerves going to the cranial nerves that control the sides of the face. Damage to these nerves usually happens on only one side of the face. This nerve damage causes that side of the face to hang lower or sag. Usually the lower eyelid and lips sag. This problem, which is called Bell's palsy, happens all of a sudden and tends to correct itself most of the time.



Diagnosis & Tests

The diagnosis of diabetic neuropathy is made on the basis of symptoms and a physical exam. During the exam, the doctor may check blood pressure and heart rate, muscle strength, reflexes, and sensitivity to position, vibration, temperature, or a light touch.

The doctor may also perform other tests to help determine the type and extent of nerve damage including a foot exam, nerve conduction test, electromyography test, sensory testing, heart rate variability check, ultrasound, and a nerve or skin biopsy.

A comprehensive *foot exam* assesses skin, circulation, and sensation. The test can be done during a routine office visit. To assess protective sensation or feeling in the foot, a nylon monofilament (similar to a bristle on a hairbrush) attached to a wand is used to touch the foot. Those who cannot sense pressure from the monofilament have lost protective sensation and are at risk for developing foot sores that may not heal properly. Other tests include checking reflexes and assessing vibration perception, which is more sensitive than touch pressure.

A *nerve conduction test* checks the transmission of electrical current through a nerve. With this test, an image of the nerve conducting an electrical signal is projected onto a screen. Impulses that seem slower or weaker than usual indicate possible nerve damage. This test allows the doctor to assess the condition of all the nerves in the arms and legs.

An *electromyography (EMG) test* shows how well muscles respond to electrical signals transmitted through nerves. The electrical activity of the muscle is displayed on a screen. A response that is slower or weaker than usual suggests damage to the nerve or muscle. This test is often done at the same time as nerve conduction tests.

An *ultrasound test* uses sound waves to produce an image of internal organs. An ultrasound of the bladder and other parts of the urinary tract, for example, can show how these organs preserve a normal structure and whether the bladder empties completely after urination.

Brain Damage

Current research indicates a connection between diabetes and Alzheimer's disease. Since diabetes damages the nerves of the peripheral and autonomic nervous systems, it would follow that, eventually, it would affect the nerve cells of the brain itself.

The average human brain, which weighs about 3 pounds, is comprised of billions of neurons (brain cells), water, and phospholipids, namely arachidonic acid and docosahexaenoic acid. The brain produces electrical signals, which, together with chemical reactions, lets the parts of the body communicate. Although the brain is only 2% of the body's weight, it uses 20% of the oxygen supply, more than 50% of the glucose, and gets 20% of the blood flow. Blood vessels (arteries, capillaries, veins) supply the brain with oxygen and nourishment, and take away waste. More subtly, the blood-brain barrier protects the brain from chemical intrusion from the rest of the body. Blood flowing into the brain is filtered so that many harmful chemicals cannot enter the brain.

When a part of the brain (e.g. brain cells, blood vessels, neurotransmitters) becomes damaged due to a combination of consistently high blood glucose levels and other factors, after a period of years, a diabetic may develop Alzheimer's or other brain-related ailment. These other factors may include exposure to aluminum (e.g. sodas, aluminum utensils) and other chemicals and toxins that have gradually built up in the body, and some are accumulating in the brain. This can lead to a formation of a sticky plaque that inhibits the transmission of brain signals. This decrease in signal causes atrophy and death of the brain cells, which leads to decreased signal transmission, and decreased neural transmission, which leads to further deterioration of the brain's function. This decrease in brain function may be exhibited in many ways, including a significant increase in memory loss, e.g. confusion, forgetfulness, or a major change in behavioral and personality such as unprovoked anger or loss of social skills.



Note: Neurotransmitters are small molecules whose function is to transmit nerve signals (impulses) from one nerve cell to another. Neurotransmitters are chemical messengers that neurons use to tell other neurons that they have received an impulse. There are many different neurotransmitters - some trigger the receiving neuron to send an impulse and some stop it from doing so. Neurotransmitters include: acetylcholine, serotonin, histamine, glutamate, gamma aminobutyric acid

glycine, aspartate, histamine, norepinephrine, epinephrine (adrenalin), endorphins, dopamine, adenosine triphosphate (ATP), and nitric oxide.

Because of the amount of time that it may take for the brain to begin deterioration, the diabetic will experience problems with one or more of the other organs long before a disease like Alzheimer's settles in. Consequently, there is time to nourish, protect, and exercise the brain to prevent these types of complications. Refer to the wellness protocol section in this chapter for more details.

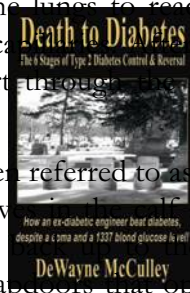
Cardiovascular (Heart) Disease

The circulatory system, which consists of the heart, arteries, veins, capillaries, and blood, is responsible for delivering oxygen and other nutrients to cells throughout the body. The heart's pumping action forces oxygenated blood from the lungs to reach millions of cells throughout the body via arteries and capillaries. Once the cells have been nourished, blood returns to the heart through the venous system and is then re-oxygenated in the lungs.

A muscle-vein system, often referred to as the "second heart", is a system of muscles, veins, and valves that work together to push deoxygenated blood from the heart and foot that work together to push deoxygenated blood back to the heart and lungs. The second heart vein valves act as traps that open and close with each muscle contraction to prevent the backflow of blood.

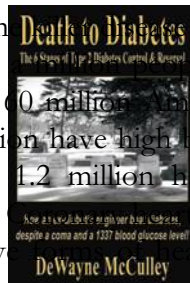
The major types of vascular disease that affect the circulatory system are cardiovascular disease, which affects the heart (and, is sometimes referred to as heart disease); cerebrovascular disease, which affects the brain; and, peripheral vascular disease, which affects the legs. If blood flow is blocked in one of these areas, it may cause a heart attack, a stroke, or a cramping pain in the leg muscles on exertion (intermittent claudication). When second heart vein valves in the legs become defective or weak, blood can pool in veins causing varicose veins, spider veins, and swelling.

A **heart attack** (or myocardial infarction) occurs when a blockage develops in one of the arteries supplying blood to the heart. A **stroke** occurs when the blockage develops in one of the arteries supplying blood



to the brain. A leg cramping occurs when the leg muscles are not being supplied with enough blood for the physical effort demanded. In the case of a heart attack or a stroke, a lack of blood stops the heart or brain from working so it shuts down and the body collapses. In the case of leg cramping, a condition called normal inadequate leg circulation (NALC) can develop when leg valves do not close completely, resulting in feelings of heaviness, a sensation of tension (chiefly located in the calves), restless legs, and edema (swelling). The rosy, swollen knots known as varicose veins occur when the incompetent valves cause blood to pool in the larger leg veins, forcing them to bulge against the skin surface. This slowing of the blood transit time triggers the clotting response causing pockets to form, trapping blood and resulting in minor clots and inflammation. This condition, called phlebitis, can become life threatening if the clot breaks free and travels to the heart, brain, or lungs.

Heart disease is the number one killer in most countries including the United States, where over 600,000 people die each year, one death every 33 seconds. More than 100 million Americans have some form of cardiovascular disease, 50 million have high blood pressure, 12.6 million have coronary heart disease, 1.2 million have heart attacks, and 4.6 million have suffered a stroke. Heart disease and atherosclerosis are the two major degenerative heart disease that account for most of the deaths.



For most people who don't have diabetes, heart disease speaks loud and clear. Inadequate blood flow to the heart muscle causes a variety of signs and symptoms, such as chest pain or pressure, pounding heartbeat, shortness of breath, jaw or arm pain, and sweating. They know something's wrong and are more likely to seek help. In people with diabetes, heart disease often doesn't offer such clues. That type of heart disease is called silent ischemia. The lack of symptoms may give you a false sense of good health. And that may prevent you from seeking medical care or treatment until noticeable and more serious complications have occurred. You may have had a heart attack and not even know it.

Unfortunately, most people with diabetes believe that amputation and blindness are their biggest threats. They aren't aware that they are at an

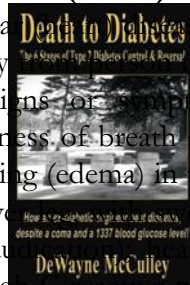
increased risk of heart attack and stroke. **In fact, two out of every three diabetics die from a heart attack or a stroke.** According to a recent study conducted by the Yale University School of Medicine, more than one fifth of patients with Type 2 diabetes have decreased blood flow to the heart, but no symptoms to suggest there is a problem. Known as myocardial ischemia, this serious condition occurs when the heart does not receive enough blood to meet its metabolic needs, usually due to inflammation and plaque build-up in the coronary arteries. When no symptoms are present, this is usually due to “silent” inflammation. As a result, the risk of sudden death from a heart attack, even though there is no history of heart disease, is as high as the risk in people without diabetes who have had a heart attack. That’s why diabetes is called a heart disease equivalent: Having diabetes is like having survived a heart attack.

Symptoms of Cardiovascular (Heart) Disease

Symptoms of cardiovascular disease vary according to the type of heart disease, and they vary from person to person. The following is a list of some of the early signs for symptoms of heart disease/stroke: shortness of breath; shortness of breath after exercise; pain or tightness in the chest (angina); swelling (edema) in the legs and feet; pain in one of the legs, usually in the lower leg; swelling and discoloration; pain in the legs with walking (claudication); heart palpitation, arrhythmia; cold feet and/or cold hands; high C-reactive protein level; high homocysteine level; slurred speech, memory loss, muscle weakness, numbness. But, you may not exhibit any of these signs. If you do exhibit any of these signs, you should contact your doctor for a physical or check up – to avoid one of the major symptoms of heart disease: sudden death from high stress.

Note: The 64-slice CT scanner can provide detailed images of the heart and arteries for an easier, non-invasive diagnosis.

According to the Mayo Clinic: “Diabetes damages your cardiovascular system, putting you at increased risk of a sudden heart attack or stroke.” Your risks are higher because of the damage that diabetes can cause to your major arteries, including the blood vessels that supply blood to your heart and brain. Another grave complication is gangrene, due to poor circulation, which usually leads to nerve damage and amputation.



WARNING: If you believe that you are having a heart attack, sit down, call 911, chew an aspirin tablet (if you're not allergic), take deep breaths to inhale extra oxygen, and cough every few seconds to keep your heart beating at a reasonable rate.

When the circulatory system is working properly, it delivers blood throughout the body, utilizing and providing specific nutrients to all the organs, tissues, and cells of the body. These key nutrients include CoQ10, l-carnitine, Vitamin C, Vitamin E, Omega-3 EFAs, magnesium, folate, and arginine. But, when there is a chronic deficiency of these or other nutrients, the circulatory system starts to struggle and does not work as effectively. Over time, components of the circulatory system such as the blood vessels may become inflamed and damaged. This puts additional stress on other components of the circulatory system such as the heart, which can lead to a *sudden* stroke or heart attack. However, a consistent exercise program and a well-designed nutritional program that addresses these specific nutritional deficiencies can be very beneficial in preventing and reversing heart disease and other circulatory issues without the need for drugs. Refer to the wellness plan in this chapter for more details.



High Blood Pressure

High blood pressure, or hypertension, is usually one of the first signs that the cardiovascular system is lacking key nutrients and is under serious stress and deterioration. This is due to the heart's extra force required to push the blood through the arteries eventually causing damage to the inner lining of the arteries. This, in turn, causes inflammation and leaves the arteries susceptible to the buildup of fatty plaque that can narrow or block the arteries and reduce blood flow to the body's organs. When untreated, high blood pressure can lead to kidney damage, heart failure, stroke, and loss of vision from damage to the retina.

Unfortunately, high blood pressure is a “silent” *symptom* that goes undetected until another problem arises that triggers the need for a physical exam, e.g. blurry vision, constant headaches, heart arrhythmia, kidney problems. The key organs that are involved with high blood pressure include the heart, kidneys, arteries, and the neural and hormonal systems. **The combination of high blood pressure, obesity and diabetes is particularly stressful on the kidneys.**

High blood pressure is generally defined as a level exceeding 140/90 mm Hg on multiple occasions. The systolic blood pressure, which is the first number, represents the pressure in the arteries as the heart contracts and pumps blood throughout the circulatory system. The diastolic pressure, which is the second number, represents the pressure in the arteries as the heart relaxes after the contraction.

An elevation of the systolic or diastolic blood pressure increases the risk of developing heart (cardiac) disease, kidney (renal) disease, hardening of the arteries (arteriosclerosis), gangrene, eye damage, and stroke (brain damage). Usually a high systolic number indicates problems with the cardiovascular system and the liver, while a high diastolic number indicates problems with the kidneys and the liver. These complications of high blood pressure are of **end-organ damage** because damage to these organs is **end-organ damage** because of chronic (long duration) high blood pressure. Accordingly, the diagnosis of high blood pressure in an individual is important so that efforts can be made to normalize the blood pressure and, thereby, prevent the complications.

For some people, high blood pressure may be defined at a level lower than 140/90 mm Hg. For example, in certain situations, such as in patients with long duration (chronic) kidney diseases that spill protein into the urine (proteinuria), the blood pressure is ideally kept at 125/75, or even lower. The purpose of reducing the blood pressure to this level in these patients is to slow the progression of kidney damage. Patients with diabetes may likewise benefit from blood pressure that is maintained at a level lower than 140/90. In addition, African-Americans, who have an increased risk for developing the complications of high blood pressure, may decrease this risk by reducing their diastolic blood pressure to 80 mm Hg or less.