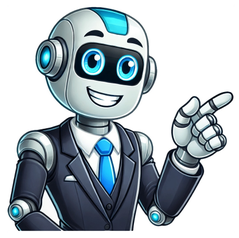
I'm not a bot



Blood test ck low

A Creatine kinase (CK) blood test is a laboratory test to evaluate the amount of creatine kinase in the blood. Creatine kinase (CK) is a dimeric enzyme also called creatine phosphokinase (CPK). Creatine phosphokinase or creatine kinase is a muscle-specific enzyme and the most sensitive indicator for muscle damage. It has a half-life of almost 2 hours(6). It’s an important enzyme that catalyzes the phosphorylation process (see below in the diagram). Creatine kinase (CK) a type of protein known as enzyme is predominantly found in skeletal muscle and mitochondrial cytoplasm. It can also be found in the brain, cardiac muscles, and other body tissues. The main role of the Creatine kinase (CK) enzyme is in the transportation and generation of phosphate molecules. Creatine kinase (CK) enzyme has two subunits: M and B. M is for muscle, and B is for the brain. Creatine kinase is a protein that is metabolized by the process of proteolysis. Proteolysis for CK occurs in lymph nodes or local tissue. Creatine kinase (CK) enzyme catalyzes the reversible phosphorylation reaction. ADP + creatine phosphate → ATP + creatine The Creatine Kinase assay shows the quantity of creatine kinase in human plasma or serum. Creatine kinase (CK) enzyme will catalyze the reaction. The high-energy phosphate group is transferred from creatine phosphate to ADP. ATP is produced. This ATP will be used to phosphorylate glucose molecules. Glucose-6-phosphate will be formed in the presence of hexokinase. Then glucose-6-phosphate dehydrogenase enzyme oxidizes Glucose-6-phosphate and reduces nicotinamide adenine dinucleotide phosphate to nicotinamide adenine dinucleotide phosphate reduced form, also called NADPH. The formation rate of NADPH is directly proportional to the activity of the Creatine kinase (CK) enzyme in the sample. N-acetyl-L-cysteine (NAC) acts as an enzyme reactivator in all these reactions. Creatine kinase (CK) enzyme has three isomeric forms; Creatine kinase-MM (CK-MM), Creatine kinase-MB (CK-MB), and Creatine kinase- BB (CK-BB).(5) Brain tissues are the primary source of Creatine kinase- BB (CK-BB). It can also be found in the lungs, prostate, uterus, and thyroid. CK-MB is highly concentrated in cardiac muscles. It is mainly found in type 1 muscle fibers. It is more sensitive and specific for detecting myocardial necrosis than total CK enzyme. Compared to total CK in skeletal muscles, 1-3% is CKMB, and in cardiac muscles, it is 15-30%(5). CK-MB can also be found in other structures like the prostate, intestine, uterus, and diaphragm. CK-MM is an isoform of the CK enzyme highly concentrated in skeletal muscles. That’s why it’s used to diagnose muscular disease. CK-MB is the most sensitive and specific indicator for diagnosing acute MI. After 3-4 hours from the onset of myocardial injury, CK-MB level increases. It will reach its peak in 12-18 hours. It will fall to its baseline within 2-3 days. Because it takes a few hours to elevate, it’s needed to do serial measurements for 24 hours. Figure: CPK Kinetics. Showing release phase into A, serum; B, peak measured activity, and C, disappearance of CPK from serum. The slope of the disappearance segment has bee to calculate infarct size. Adult/elderly • Male: 55 -170 units/L (SI units)• Female: 30 -135 units/L (SI units)Newborn• 68-580 units/L (SI units) – this is approximately 2 to 3 times the adult valuesAbove 90 yearsMales = 21 – 203 U/LFemales = 22- 99 U/L Creatine kinase-MM (CK-MM) also called CK-3• 94 -100%Creatine kinase-MB (CK-MB) also called CK-2• 0 – 6 %Creatine kinase- BB (CK-BB) also called CK-1• 0% Note: Creatine kinase (CK) enzyme values may be variable according to the age, race, gender, and physical activity. The value of Creatine kinase (CK) is higher in newborns and black males. There is also variation in the upper limit of creatine kinase enzymes in athletes. TypesCompositionCommentSkeletal Muscle98% – CK-MM2% – CK-MBElevated in muscle diseaseCardiac Muscle70-80% – CK-MM20-30% – CK-MBCardiac muscle has highest amount of CK-MBBrainCK-BBPlasmaMainly CK-MM Visual Representation for better understanding Creatine kinase (CPK/CK) isoenzymes subtypes and distribution Creatine kinase (CPK/CK) isoenzymes subtypes and (distribution in percentages) Total Creatine kinase (CPK/CK) distribution The sample is collected in heparinized tubes. Subject is not needed to avoid taking meals. We can draw the sample at any time of the day. It is important to collect the blood sample after or an hour before an intramuscular injection. Storage temperature should be between 4℃ to 24℃ for next 3 days. IndicationCK blood test is used to evaluate:• Skeletal • Muscle• Heart• BrainType of specimenSerum or plasmaContainer usedHeparinized tube is preferredQuantity0.6ml of blood should be drawn for testSpecimen storage (Serum and plasma)• 20 to 25°C for two days (3)• 2 to 8°C for seven days (3, 4)Precautions• Store the sample in the proper light and temperature.• Avoid hemolyzed blood sample.• Don’t take a sample just after the IM injection.• Rule out trauma, it may make the test unreliable.• No special preparation is needed. In case of muscular damage, creatine kinase evaluation should be suspected. In case of inflammation, damage, or injury to skeletal muscles, necrosis, or heart muscle damage, serum creatine kinase level is elevated. Level of creatine kinase elevates in neuromuscular disorders. Serum level of creatine kinase is increased in all types of muscular dystrophy. Serum creatine kinase level falls in older ages. Serum creatine kinase level increases almost 3 to 6 times in Duchene muscular dystrophy. Levels may also increase after IM (Intramuscular) injection or surgical intervention. Serum creatine kinase level is helpful in making a diagnosis and in the monitoring of muscular diseases like neuromuscular disorders and muscular damage. The increased value of the Creatine kinase (CK) blood test is diagnostic for several diseases like: Acute myocardial infarction (MI) Myopathies Rhabdomyolysis Muscular dystrophy Malignant hyperthermia Neuroleptic malignant syndrome Paralysis (periodic) Drug-induced myopathies Renal damage Intramuscular injection Strenuous exercises Creatine kinase value is linked with the amount of muscle in the body. Its value may be below the normal range in the following conditions: Lean muscle mass In females as compared to males Alcoholic liver disease Rheumatoid arthritis Some are confused about the Creatine and Creatinine blood tests – here is a table of comparison between them to help you understand better CreatineCreatinineThe Creatine is 2-(carbamimidoyl-methyl amino) acetic acidCreatinine is 2-amino-1-methyl-5h-imidazole-4-oneThe creatine is a linear molecule and amino acid. Creatinine is a heterocyclic structure and a chemical waste. It is formed by protein metabolism. It is formed by creatine metabolism. It is used as a supplement to increase muscle mass. It is a waste product of creatine metabolism. It provides energy to muscles. It is used along with BUN to determine renal function. It is produced by the liver, pancreas, and kidneys and is sent to the muscles. It is produced in the muscles by creatine breakdown. The misinterpretation of the Creatine kinase (CK) blood test is due to the presence of 5-7% of CK-MB in skeletal muscles. CK-MB is cardiac muscle-specific but skeletal muscle injury can also elevate it. And it can be misinterpreted. (2) CK-MB enzyme is primarily present in the heart muscles and is a very useful marker for diagnosing acute myocardial injury. It can also be elevated in the following conditions:• Cardiac surgery• Cardiac contusion • Trauma• Myocarditis• Defibrillation or cardioversion• Endomyocardial biopsy Creatine kinase (CK) is an enzyme found primarily in the brain, skeletal muscles, and heart. Conditions that cause damage to any of these three areas produce an elevated level of CK. For this reason, CK tests are often run to detect muscle damage, especially if someone is taking a drug such as a statin, using cocaine, or has been exposed to a toxin. If you’re experiencing chest pain or weakness your doctor may order a CK test to determine if you’ve had a heart attack. It is also common for doctors to use this test to evaluate the extent of sports injuries. Creatine kinase levels reflect the amount of muscle in the body, and as such men typically have higher levels than women. Finally, a CK test may be used to diagnose rhabdomyolysis, a condition characterized by the rapid breakdown of muscle tissue. It is worth noting that a normal level of CK does not necessarily mean that there is no muscle damage. It could mean that the damage occurred long enough ago for levels to return to normal. Frequently, a succession of CK tests are run as changes in CK levels due to muscle damage can take hours to present. Normal Ranges: Normal CK levels change drastically depending on factors such as age, gender, and activity level. Generally, 24-204 U/L is considered normal. Creatine Kinase and liver enzymes (ALT and AST): - A normal CK level with elevated ALT and AST enzymes would sway a doctor toward thinking there’s a liver problem; - A high CK with high ALT and AST levels suggests that something’s going on in the muscle. Doing additional enzyme tests after a general screen can help a doctor decide whether the high ALT and AST are more likely the result of liver or muscle damage. Of course, there could be a problem in both liver and muscle. Some metabolic muscle disorders, such as acid maltase deficiency and debrancher enzyme deficiency, affect both tissues. And two diseases can occur in the same person. Most of the time, elevated ALT and AST levels in people with degenerating muscles do not mean much, other than that these enzymes, along with CK, are leaking out of the muscles. (The high levels of enzymes do no harm in and of themselves.) But sometimes, depending on results of other tests and the person’s history, they can mean there’s trouble in the liver or even in another organ. Creatine kinase is an important enzyme needed for energy production and muscle function. Athletes have more of this enzyme in their blood, but so do obese and overweight people. High levels can tell us if there is muscle, heart, or brain damage. Keep reading to learn more about this enzyme, what it means if your levels are high or low, and how to address irregular values. What is Creatine Kinase? Creatine kinase (CK), also known as creatine phosphokinase, is an enzyme that plays a role in energy production. Higher amounts of this enzyme are found in tissues that use a lot of energy, such as the muscles (including the heart) and the brain [1]. Creatine kinase will leak into the blood when these tissues are damaged. That’s why blood levels of this enzyme can tell us whether there has been tissue damage, i.e. a heart attack, stroke, sports injury, or muscle disease [1, 2]. If your creatine kinase levels are high, your doctor may order a creatine kinase isoenzyme tests to determine which type of creatine kinase enzyme is high [1, 2]: CK-MM: muscles CK-MB: heart CK-BB: brain Normal Range There is still no universally agreed upon range for creatine kinase. Different laboratories have different normal ranges, reported in U/L (units per liter) or ukat/L (microkatals per liter). People who have greater muscle mass have higher CK levels. That is why men usually have higher CK values than women. The low normal limit for both men and women is approximately 20 – 30 U/L (0.34 – 0.51 ukat/L). The upper normal limit for men is anywhere from 200 to 395 U/L (3.4 – 6.8 ukat/L) and for women, it’s up to 207 U/L (3.52 ukat/L) [3, 4, 5]. CK levels are around 70% higher in healthy African Americans, compared to people of European descent! Some studies indicate that healthy black men and women can have significantly higher values than the currently recognized normal range(s) – up to 712 and 323 IU/L, respectively [5, 6, 7]. High Creatine Kinase Levels Elevated CK points to recent tissue damage. However, it doesn’t point to a cause or the location of the damage. It is possible to be healthy and have higher CK levels. As mentioned above, people of African descent can have up to 70% higher CK levels than healthy Caucasians [6, 5, 7]. Your doctor will interpret this test, taking into account your medical history and other test results, and will repeat it if necessary. Furthermore, a “falsely high CK” due to exercise or other strenuous physical activity is very common. In a large community study of over 12,000 people in Norway, people who had elevated CK levels were re-tested after 3 days of rest. CK levels returned back to normal in 70% of the cases [8]. To ascertain that the rise in CK is due solely to exercise or exclude physical activity as a factor, the test should be repeated after a week of rest (i.e. 7 days without exercise). If elevated CK persists, it is more likely to be due to an underlying health issue. People who have elevated creatine kinase due to an underlying health issue may experience the following symptoms [9]: Muscle weakness Cramps Muscle pain Fatigue Inability to exercise (due to pain or weakness) Dark urine Causes of High Creatine Kinase Levels Causes shown below are commonly associated with elevated creatine kinase. Work with your doctor or another health care professional to get an accurate diagnosis. 1) Exercise/Training Exercise and training are the main cause of increased creatine kinase levels [10, 11, 12]. CK levels transiently increase to over 30 times the upper normal limit within 24 hours of strenuous physical activity and then slowly decline back to normal over the next 7 days. To what degree CK spikes depends on the type and duration of exercise [8, 13, 14, 15]. Studies have shown that even stretching can increase CK [16]! Also, people who are untrained will experience greater spikes in CK levels due to greater muscle damage [8]. On the other hand, athletes have higher resting CK levels compared to non-athletes. A study of over 700 athletes suggests that normal reference ranges for athletes may be over two times higher than normal ranges: 82 – 1,083 U/L in men and 47 – 513 U/L in women [12]. Fun fact: The highest creatine kinase on record was over a million and was caused solely by a heavy workout [17]! 2) Obesity Although higher CK levels are found in athletes, conversely, high CK levels are also found in obese and overweight people. In a study of 1,444 subjects, higher CK levels were linked with higher BMI and waist-to-hip ratio [18]. In another study of over 10,000 adults, overweight and obese men had almost 2 times greater odds of having elevated CK [19]. Similarly, in 4,500 people, CK levels were higher in people with greater body mass [4]. Scientists may have found an explanation for this. They discovered that obese and overweight people have more fast-twitch (type II) muscle fibers and less slow-twitch (type I) muscle fibers. Fast-twitch muscle fibers have higher CK activity [4]. 3) Underlying Health Issues Creatine kinase will increase with muscle, heart, or brain damage – these can be caused by an underlying disease or disorder, including: Muscle injuries, physical trauma, and burns [20, 21, 22, 23, 24] Genetic muscle disorder, such as muscular dystrophy (i.e Duchenne muscular dystrophy) [25, 26] Infections by viruses, bacteria, fungi, or parasites, causing muscle wasting [27, 28, 29, 30] Fever, accompanied by shivering [31] Hypothermia, a dangerous drop in body temperature [32] Hormonal disorders, such as hypothyroidism, Addison’s disease, acromegaly (a disorder where the pituitary gland produces too much growth hormones), and Conn’s syndrome/hyperaldosteronism (a condition where too much aldosterone is produced in the adrenal glands) [33, 34, 35, 36, 37, 38, 39] Metabolic disturbances such as hyponatremia (low sodium), hypokalemia (low potassium), or hypophosphatemia (low phosphate) [8, 40, 41, 42, 43] Diabetes; when it causes muscle dysfunction (myopathy) [44] Some cases of autoimmune diseases when there is muscle involvement, such as lupus, rheumatoid arthritis, and celiac disease [45, 46, 47] Heart attacks [1, 48, 49] Head/brain injury [50, 51, 52] Seizures [53, 54] Some cancers [55, 56] 4) Medical Interventions Interventions that damage tissues, such as injections into the muscles or any type of surgery, will increase CK levels [8, 57, 58]. 5) Drugs and Toxins Cocaine increases CK levels [59, 60, 61]. Some pharmaceutical drugs also have the potential to increase CK: Statins, the cholesterol-lowering drugs. In fact, muscle symptoms are the most frequent side effect of statin therapy [62, 63, 64] Fibrates, another group of drugs that decrease cholesterol [8, 65] Beta-blockers and angiotensin II receptor blockers used to decrease blood pressure [66, 8, 67] Glucocorticoids used to decrease inflammation [68] Antipsychotics [69] Antibiotics, antiretrovirals, and antimalarials [70, 71, 72, 8, 73] Isotretinoin, an acne medication [74] Colchicine, used to prevent gout [75] Chemotherapy drugs [76] Finally, toxins like snake venom or carbon monoxide can increase CK levels [77, 78]. Health Effects of High Creatine Kinase Level 1) May Be Linked to Lower Inflammation A study with over 12,000 people found that higher CK was linked to lower hs-CRP, which is a measure of chronic inflammation [79]. The same association was found in another study of 454 overweight and obese people [80]. 2) May Prevent Blood Clotting High plasma CK, even in the normal range, may decrease the ability of our blood to clot properly. This is especially the case after exercise when CK levels spike [81]. Decreasing Creatine Kinase Elevated creatine kinase can be a sign of serious tissue damage or an underlying disease or disorder. The most important thing is to work with your doctor to find out what’s causing your elevated creatine kinase and to treat any underlying condition! Refrain from strenuous exercise before testing. It causes muscle damage and increases CK levels [10, 11, 12]. Discuss the lifestyle changes listed below with your doctor. None of these strategies should ever be done in place of what your doctor recommends or prescribes! 1) Improve Muscle Recovery If your CK gets high because your muscles get damaged after exercise, there are some steps you can take to improve muscle recovery. Studies suggest that after strenuous exercise, an increase in creatine kinase (muscle damage) can be attenuated by consuming enough carbs, protein, and antioxidants [82]. A small study with 14 men showed that sports massage 2 hours after exercise decrease CK levels [83]. A meta-analysis of 14 studies concluded that light therapy (low-level laser therapy and/or light-emitting diode therapy) had beneficial effects on decreasing CK levels after exercise [84]. 2) Lose Weight If Overweight Lose some weight if you are overweight. People with higher BMI and weight have increased creatine kinase levels [4, 18]. Low Creatine Kinase Levels Causes of Low Creatine Kinase Levels 1) Low Muscle Mass The most common cause of low creatine kinase levels is muscle wasting (muscle atrophy) due to physical inactivity, illnesses, or old age [85]. 2) Inflammation in Autoimmune Disease Creatine kinase levels can be significantly reduced in autoimmune diseases, such as lupus and rheumatoid arthritis [86, 87, 88, 89]. The more inflammation there is, the lower creatine kinase levels can get. 3) Pregnancy Total creatine kinase levels are reduced in the second trimester of pregnancy. However, they increase in late pregnancy [90]. Health Effects of Low Creatine Kinase Levels 1) Are Linked to Fainting Studies suggest that the more creatine kinase a person has within the normal range, the better their heart and muscles can function. In a study of 442 people, people with low creatine kinase levels were 73% more likely to faint [91]. 2) Increase Risk of Death Because creatine kinase is a measure of muscle mass, it is not surprising that a link was found between low creatine kinase levels and higher mortality. Critically ill people who are weaker (with less muscle mass) have a higher risk of dying [92]. In two studies with over 1.8k patients each, critically ill and chronic kidney disease patients with low creatine kinase levels had higher mortality rates [93, 94]. Increasing Creatine Kinase The most important thing is to work with your doctor to find out what’s causing your low creatine kinase and to treat any underlying condition! Discuss the lifestyle changes listed below with your doctor. None of these strategies should ever be done in place of what your doctor recommends or prescribes! 1) Exercise Exercise and physical activity, in general, build muscle and thereby increase creatine kinase levels. Most athletes have high CK levels [11, 85]. 2) Protein-Sufficient Diet and Muscle-Building Supplements Make sure your diet has enough protein to sustain your health and your level of physical activity. A study suggests that creatine supplementation may help build muscle and increase creatine kinase activity in athletes [95]. Remember, always speak to your doctor before taking any supplements, because they may interfere with your health condition or your treatment/medications!