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A high hemoglobin level can lead to headaches, fatigue, dizziness, and more. Or, it may exist for years and only be discovered with routine blood tests in the absence of symptoms. High levels are generally considered to exceed 17.2 grams per deciliter (g/dL) in males and 15.1 g/dL in females. A diagnosis of high hemoglobin means you have an above-normal amount of the protein in red blood cells that carries oxygen. A high level may be due to lifestyle factors, like smoking or living in a high altitude, or medical conditions like heart failure. Treatment focuses on the cause, but stroke and other complications can arise. Illustration by Laura Porter for Verywell Health High hemoglobin levels usually don't cause any symptoms. If symptoms are present, they may include: HeadachesFatigueWeaknessDizzinessBlurred visionRinging in the ears (tinnitus)Symptoms of the underlying condition causing levels to rise (which can vary) Complications of high hemoglobin can be serious. They include:Heart attackStrokeBlood clots Several lifestyle factors can contribute to high hemoglobin levels, including:Smoking: Red blood cells and hemoglobin increase to compensate for high levels of carbon monoxide in cigarette smoke.High altitude: Lower oxygen pressure in your environment makes your body require more hemoglobin to maintain your oxygen needs.Dehydration can sometimes give you false high hemoglobin results when levels are normal. This is believed to be because dehydration changes the amount of fluid in your blood. Rehydrating usually corrects the measurement. Medical conditions can lead to high hemoglobin levels. With a chronic condition, you may receive a diagnosis before getting an abnormal hemoglobin test result. These conditions can include:Congenital heart diseaseObstructive sleep apneaChronic obstructive pulmonary disease (COPD) (a group of chronic, inflammatory lung diseases that includes emphysema)Heart failureKidney diseaseLiver or kidney cancerPolycythemia vera (a blood disorder) Erythropoietin is a kidney hormone that stimulates red blood cell production and is used to treat some medical conditions. It is sometimes used to enhance athletic performance as well. Its use may lead to high hemoglobin levels. High hemoglobin levels show up in a blood test that is part of a routine complete blood cell count (CBC). This is a simple blood draw test. A healthcare provider will collect blood in a syringe and send it to a laboratory for testing. You also may need the test because: You are having surgery, or you are recovering from it.Your blood is monitored as part of managing a chronic condition, like cancer or rheumatoid arthritis.You throw up blood or have blood in your stool (poop).Malnutrition is a concern.You experience headaches, fatigue, poor health, or unexplained weight loss.You take medication that can affect hemoglobin. Normal hemoglobin values vary slightly depending on the lab. Hemoglobin is usually reported in grams per deciliter (g/dL). Assigned SexNormal HemoglobinMale13.8 to 17.2 g/dLFemale12.1 to 15.1 g/dL The treatment for a high hemoglobin level depends on the cause. You may just need treatment for the underlying condition or you may need additional treatment for the high hemoglobin. These treatments can include:Medications or surgery for heart diseaseOxygen supplementation, medications, or surgery for lung diseaseCancer treatmentFluids and electrolytes for dehydrationContinuous positive airway pressure (CPAP)if sleep apnea is the cause High hemoglobin, especially in polycythemia vera, is often treated withtherapeutic phlebotomy. This involves removing a unit of blood, similar to making a blood donation. It may need to be done several times. Jakafi (ruxolitinib) and other medications, including aspirin, also can be used. Some of these medications, like erythropoietin, can reduce the number of red blood cells to limit the effects and complications of high hemoglobin levels. If you have high hemoglobin, its important to maintain a healthy diet. No specific dietary recommendations have been established, but staying hydrated and avoiding alcohol is always beneficial. It's also important to avoid foods that are high in sugar, which can contribute to obesity, inflammation, and other conditions that increase the risk of heart disease. Limit your intake of foods containing trans fats, which are in many processed foods, and saturated fats. Foods containing saturated fat include: Cured meats like salamiSausage and baconRed meatCheeseButterSome baked goods Aim to eat a healthy diet that includes: An ample amount of fruits and veggiesWhole grainsProtein sources such as fish, seafood, nuts, and lean lean, unprocessed meats or poultry Exercising regularly can help maintain overall health and lower your risk of developing some conditions that lead to high hemoglobin. The American Heart Association recommends aiming for at least 150 minutes of moderate exercise or 75 minutes of vigorous physical activity a week. Getting adequate sleep is also important for optimal health. Adults ages 18 to 60 get at least seven hours of sleep a night, according to the American Academy of Sleep Medicine. Sometimes you can't ward off high hemoglobin counts. This is the case if you have a condition such as polycythemia vera, which can't be prevented. However, depending on the cause, you may be able to improve a high hemoglobin level by: Not smoking or quitting if you doLiving at a lower altitudeStaying hydrated Maintaining a healthy lifestyle can help prevent some conditions that cause high hemoglobin, such as heart failure and kidney disease. Healthy lifestyle choices include: Regularly eating fruits and veggiesLimiting foods high in sugar, saturated fats, and trans fatsNot drinking alcoholExercising regularly While a random headache or dizzy spell probably isn't cause for concern, reach out to a healthcare provider if dizzy spells or headaches become more frequent or consistent, or are otherwise concerning. It's also important to contact a healthcare provider if you experience any symptoms of an underlying condition that causes high hemoglobin. Elevated hemoglobin doesnt usually cause symptoms, but it can cause complications, including blood clots. A high hemoglobin level is often an indicator of disease, including polycythemia vera, cancer, heart disease, lung disease, and kidney or liver disease. Smoking and high altitudes can also cause hemoglobin levels to increase. Hemoglobin levels can be checked with a routine blood test. Treatment is usually necessary for the underlying cause, and sometimes treatment is specifically needed for high hemoglobin levels as well.High hemoglobin (Hgb) count occurs when your red blood cells have an unusually high amount of the blood protein hemoglobin. Hemoglobin gives red blood cells their red color. It helps carry oxygen from your lungs to the rest of your body and carries carbon dioxide (CO2) from the rest of your body back to your lungs. Another name for high hemoglobin is polycythemia.What is the difference between high hemoglobin and hematocrit?Hematocrit is the volume of red blood cells compared to other blood cells. People with high hemoglobin often also have high hematocrit, meaning they have irregularly high red blood cell counts.What are high hemoglobin levels?Both your biological sex and age affect your hemoglobin levels. Typically, hemoglobin levels are considered high if theyre:Above 16.5 grams per deciliter (g/dL) in an adult male.Above 16 g/dL in an adult female.Above 16.6 g/dL in a child.Above 18 g/dL in an infant.Environmental factors such as altitude, time of day and how hydrated you are also can affect your hemoglobin levels.How do I know if I have high hemoglobin?A blood test is the only way to know if you have high hemoglobin. Some of the side effects of high hemoglobin may include:Dizziness.Easy bruising or bleeding.Excessive sweating (hyperhidrosis).Fatigue.Headaches.Joint swelling.Unexplained weight loss.Yellowish eyes or skin (adult jaundice).Is high hemoglobin serious?You should take high hemoglobin levels seriously. Sometimes, high hemoglobin points to a serious underlying condition. Even if you dont have an underlying condition, its important to treat a high hemoglobin count. Irregularly high hemoglobin levels can lead to complications such as blood clots.Hemoglobin is the oxygen-carrying protein that is present in the red blood cells, whereas hematocrit is the percentage of the volume of blood that is made up of red blood cells. The following write-up provides information on the circumstances under which a person may have high hemoglobin and hematocrit. Blood is a specialized body fluid that comprises blood platelets, white blood cells, red blood cells, and blood plasma. 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To obtain a complete picture of your health, your hematocrit levels are usually attributed to your red blood cell count, platelet count, and other components of your complete blood count. A high hematocrit test result above 48.6% (in men) or 44.9% (in women) is considered above normal and may indicate a blood disorder or other medical condition. Hematocrit levels can vary by gender and age group. Hematocrit results that fall outside of the following ranges are abnormal: Table. Normal hematocrit ranges based on gender and age group Gender and age group Normal hematocrit values Men 41% to 50% Women 36% to 44% Newborns 45% to 61% Toddlers 32% to 42% Symptoms of elevated hematocrit levels vary depending on the underlying medical condition and may include: Headaches and dizziness: This occurs when the blood becomes too concentrated because of excess red blood cells (RBCs). High hematocritlevels can cause headache and dizziness as a signal and coping mechanism. Concentrated blood may become viscous: Blood may clot, lose fluid, thicken, and become sticky, causing the brain to receive slightly less oxygen. When the brain does not get enough oxygen, things can get serious quickly. Weakness and fatigue: Fatigue is a general physiological reaction to viscous blood, which has difficulty supplying oxygen and nutrients to the rest of the body. Speak to your doctor immediately if you always feel weak. Tachypnea (rapid breathing): High hematocrit results are frequently accompanied by tachypnea or rapid breathing, which occurs more than 20 times per minute. This is the body's short-term compensatory response to inadequate oxygen delivery. Bruises: If you have polycythemia vera, high hematocrit levels can cause bruising. Blood clots are more likely to form in concentrated, viscous blood. Violet-to-red colored bruises can appear anywhere on the body. The bruises to look out for are those that appear to have no cause. Odd skin sensations: High hematocrit levels can cause various changes in your skin. When the blood flowing beneath your skin lacks oxygen, it can interfere with the way your sensory receptors function. Odd sensations may include itching or paresthesia (a tingling, prickling, or burning sensation on the soles of the hands and feet). Other symptoms of elevated hematocrit levels may include: Inability to exercise as much as usual Shortness of breath after exercise Heart palpitations Headaches Blurred vision Confusion Stomach discomfort Nosebleeds Thirst Dry mouth, lips, and eyes Dark yellow and strong-smelling urine Reduced frequency of urination, usually less than 4 times per day Sickle cell disease is named after a farming tool. See Answer Treating high hematocrit levels involves treating the underlying cause. You can lower your hematocrit levels by following the suggestions below: Stick to low altitudes: The oxygen concentration is lower at high altitudes than at low altitudes. As an environmental adaptation, your bone marrow, which is in charge of producing red blood cells (RBCs), produces more RBCs to compensate for the low oxygen level in the body, which results in a high hematocrit concentration. Areas higher than 8,000 feet (2,438.4 m) above sea level are associated with high hematocrit levels. Moving to a lower altitude may help restore normal levels. Stop smoking: Nicotine in cigarettes and other tobacco products reduces blood flow by altering the oxygen-carrying capacity of RBCs. The body compensates for low oxygen levels by making the bone marrow produce more RBC. Giving up smoking may help lower your hematocrit levels. Avoid iron supplements: Because RBCs are essentially what make up your hematocrit, avoid taking iron supplements that can increase the production of RBCs in the blood. Stay hydrated: Dehydration causes higher hematocrit levels because there is less liquid in your body to dilute your blood. Drink 8 to 12 glasses of water a day and avoid alcohol and caffeine which both act as diuretics. Eat more grapefruit: According to recent studies, eatinghalf or a whole grapefruit a day can help lower your hematocrit levels. This is due to the fact that naringin, a flavonoid found in high concentrations in grapefruit, can cause phagocytosis, a process that naturally removes RBCs from your blood and converts them to other uses. Include antioxidants in your diet: Antioxidants aid in the protection against free radicals, which are thought to cause cancer and other blood-related diseases. Antioxidants help provide oxygen to the blood and can aid in disease prevention. Exercise in moderation: Regular moderate exercise is essential for your health; however, avoid overdoing it. Exercising too hard can increase your hematocrit levels. Take a mini aspirin: Aspirin is an anti-platelet medication that lowers your hematocrit levels. However, this should only be done as a last resort in consultation with your doctor because it can cause negative side effects. Anemia or low hemoglobin levels and low red blood cell count is a problem we hear of quite often. But some people face an issue thats quite the opposite. Elevated levels of hemoglobin or hematocrit can cause you to feel faint, impair your vision, and leave you with other problems like an enlarged spleen. Knowing the causes can help you find the right treatment and fix the problem as soon as possible.Why Is Hemoglobin So Important?Red blood cells and hemoglobin are integral to the healthy functioning of your body. The hemoglobin itself transports oxygen to various parts of your body, keeping the tissues supplied with adequate levels of oxygen. The higher your red blood cell count, the more the hemoglobin and, by extension, the better equipped your body will be to ensure oxygen is available everywhere.Normal Levels Of Hemoglobin And HematocritA blood test should help you test your hemoglobin levelsA normal healthy adult male should have hemoglobin levels of 13.8 to 17.2 g/dL.A normal healthy adult female should have a measure 12.1 to 15.1 g/dL.For newborns, the normal levels are 14 to 24 g/dL and for infants a reading of 9.5 to 13 g/dL is normal.Hematocrit tests, on the other hand, measure the levels of red blood cells in your total blood volume.Normal levels for men are between 40.7 and 50.3 percent.For women, the normal range is between 36.1 and 44.3 percent.A hematocrit range of 45 to 61 percent is considered normal for newborns while infants should have levels of 32 to 42 percent.Symptoms Of High Levels Of Hemoglobin Or Red Blood CellsPolycythemia, the opposite of anemia, is a condition in which there is an excess of red blood cells and high hemoglobin levels. In case you have polycythemia, you may experience headaches, dizziness, problems with vision, and flushing. Your spleen may also be enlarged. In addition, babies who have this problem of elevated hemoglobin linked to polycythemia may have reddish purple colored skin or may be jaundiced with yellowish eyes and skin.They are also lethargic and dont feed properly. They might experience respiratory distress or breathe rapidly. Their blood sugar levels may also be low.Causes Of High Hemoglobin Levels And Red Blood Cell CountsThis increase in red blood cells and hemoglobin is triggered by certain health problems, certain environmental factors, or physiological problems. Heres a look at the causes of high hemoglobin and hematocrit levels. Those who develop the problem due to genetic mutations have primary polycythemia, while those who get it due to some of the other causes listed below has secondary polycythemia. Stanford Childrens Health.1. Genetic Mutation: Polycythemia VeraFor some people, the high hemoglobin and hematocrit levels are due to a genetic mutation. This kind of increased level of red blood cells is known as primary polycythemia or polycythemia vera. Interestingly, it isnt an inherited condition, yet some families are more prone to this mutation to the JAK2 gene that is responsible for red blood cell production. Not enough is known yet about why this mutation occurs, but it is clear that this mutation results in elevated red blood cell and hemoglobin levels.This bone marrow disease causes your bone marrow to make excessive red blood cells and is more common in men than in women. It also tends to show up later in life and is rare in anyone under 40.2. DehydrationOne of the most common reasons for high readings on your hematocrit test is less ominous than youd think. It could boil down to your being very dehydrated. In fact, the hematocrit is even prescribed to check if someone is badly dehydrated! When the fluid levels in your blood decline due to inadequate intake of fluids and water, the red blood cell count per volume of fluid goes up. In reality, the red blood cell count itself hasnt risen but just appears to because theres less fluid. Once you rehydrate and fluid levels are back to normal, the hematocrit too will settle at normal levels.3. Living At High AltitudesHigh altitude locations have less oxygen in the environment than places that are in the plains. As a result, you take in less oxygen when you breathe in these locations. This can cause a shortage of oxygen in the blood known as hypoxia. And when that happens, your body amps up hemoglobin concentration to ensure you dont fall short of this vital element and to keep up required levels of oxygen supply.4. Heart ProblemYou may experience this increase in hemoglobin levels if you have a heart problem. Specifically, heart failure in the right side of the heart, also known as cor pulmonale, can result in excess or elevated levels of hemoglobin. The condition is caused by pulmonary hypertension or high blood pressure in the lung arteries, which puts added strain on your heart as it tries to pump blood to your lungs. Autoimmune disease, cystic fibrosis, obstructive sleep apnea, chronic obstructive pulmonary disease, and scarred lung tissue are other triggers for this heart problem that brings on higher hemoglobin levels.5. Lung Or Pulmonary DiseaseAny impairment in the function of your lungs can produce excess red blood cells. If you are unable to inhale and absorb sufficient quantity of oxygen, the oxygen supply to your body will be inadequate. Your body will them make more red blood cells to compensate for the shortfall. Severe lung conditions such as scarred or thickened lung tissue (pulmonary fibrosis) can cause this problem.6. Congenital Heart DiseaseCongenital heart disease that causes certain birth defects in the heart of the newborn is another culprit. Sometimes, when the two sides of the heart are not connected normally, oxygen levels in the blood drop. Your body then tried to compensate for this by creating more red blood cells, which causes hemoglobin level and hematocrit levels to be excessive.7. Exposure To High Carbon Monoxide LevelsIf you are constantly exposed to high levels of carbon monoxide, you could end up developing secondary polycythemia. Homes that have furnaces or fireplaces need to be well-ventilated failing to ensure a proper outlet for the burnt gases can put you at risk of developing excess hematocrit and high hemoglobin levels. A job in an underground parking garage too can increase your chances of developing the problem 8. SmokingSmoking can cause higher hemoglobin levels than normal. Research has shown that smoking tobacco results in raised hemoglobin concentrations in men and women. In fact, the increase tends to be proportional to how much tobacco is smoked.9. Heavy Alcohol ConsumptionBeing a heavy drinker too can put you at risk of high hemoglobin levels. So what qualifies as high or heavy consumption? If youre a woman who has more than 7 drinks a week or if youre male and knock back over 14 drinks, you could have a problem. Men and women who drank excessively in one study had higher average hemoglobin levels than those who didnt drink as much it was 1.9 percent higher in women and 1.3 percent higher in men.What Causes Polycythemia In Babies?Some other reasons why babies could develop this problem of high hemoglobin or excess red blood cells are listed below.:Being born at high altitudes or living at such altitudes causes babies to develop excess red blood cells as it does in adults who live in such locations.Being born post-term after the mother crosses the 42-week mark in her pregnancy can also cause elevated red blood cell counts.Having diabetic mothers can make babies susceptible.Down syndrome or chromosomal abnormalities specifically in trisomies 13, 18, and 21 may result in polycythemia.Experiencing intrauterine growth restriction or being small for gestational age can cause excess red blood cells to develop.Being the recipient of a twin-to-twin blood transfusion from ones identical twin may also result in polycythemia. What to Include in the Workup of an Elevated Hemoglobin Concentration and Hematocrit?Q:My patient has an elevated hemoglobin concentration and hematocrit; however, the reticulocyte count, ferritin level, results of hemoglobin electrophoresis, and total iron-binding capacity are normal. What is the next step after common causes of an elevated hemoglobin concentration and hematocrit, such as chronic obstructive pulmonary disease, have been ruled out?A:First, make sure that the hemoglobin level and hematocrit are truly elevated. Reasons for pseudoelevated values. In some textbooks and many laboratories in the United States and the United Kingdom,"normal ranges" are misstated. This is chiefly because most of the participants in "normal value" studies are iron-deficient blood donors or persons with anemia of other causes. There is overwhelming evidence that values up to 18 g/dL (for hemoglobin concentration) or 53% (for hematocrit) should not be considered elevated in white or Asian men who live at altitudes of 1000 m (approximately 3000 ft) above sea level or less.1 Corresponding cutoff values for white and Asian women are 16.5 g/dL and 48%. African Americans, for unknown reasons, have slightly lower normal limits-by about 0.7 g/dL for hemoglobin concentrations and by about 2% for hematocrit. The upper limit of the normal range in children is lower still. Both hemoglobin levels and hematocrit increase in a linear fashion with altitudes of more than 1000 m above sea level; thus, in mile-high Denver or in Santa Fe, NM, 19 g/dL is a normal hemoglobin concentration in a white man. These upper limits are appropriate for healthy, ambulatory, upright, or seated persons. Recumbency of 30 minutes' duration or more lowers both hemoglobin concentration and hematocrit by about 5%. Chronic illness also lowers these values, as does blood donation. It is not surprising that measurement of hemoglobin concentration and hematocrit in recumbent, hospitalized patients or in blood donors yields spuriously low "normal ranges." Thus, if the hemoglobin concentration in a healthy, ambulatory, white man is 18 g/dL, no further evaluation is required. However, it is prudent to determine that this is a stable value rather than an increase from a prior value of 16 or 17 g/dL. If an earlier value is not available, measure the hemoglobin concentration again in 4 to 6 months. hemoglobin concentration again in 4 to 6 months. If the blood sample was drawn in the morning, recheck both hemoglobin concentration and hematocrit in a sample obtained in the afternoon, following unrestricted food and fluid intake. Within-day and day-to-day normal variations in hemoglobin concentration and hematocrit are larger than is generally recognized. It is common to see in the same patient a morning hemoglobin concentration that appears slightly elevated and an afternoon concentration that is normal. Having no fluids for 8 hours overnight reduces plasma volume slightly; the lower hemoglobin value in the afternoon is the result of better hydration. Mild dehydration that results from restriction of food and fluid intake for 8 to 12 hours before patients provide blood samples for laboratory tests can also cause spurious elevations of hemoglobin concentration and hematocrit. If values are high in this setting, recheck them following hydration. Common causes of true elevations. If the hemoglobin concentration and hematocrit are truly elevated, consider the common causes first:Tobacco use, which raises carbon monoxide levels in the blood and leads to a true, although usually mild, erythrocytosis, with hemoglobin concentrations as high as 20 g/dL and hematocrits as high as 60% (in men). Measure the carbon monoxide level in patients in whom tobacco use is the likely cause of their elevated values, and counsel them to quit smoking.Obesity, which is a fairly common cause of erythrocytosis.Diuretic use; mild erythrocytosis can result from the slight reduction in plasma fluid volume produced by these medications.Chronic pulmonary disease, even when accompanied by hypoxia and cyanosis, is not usually associated with erythrocytosis, except in patients who smoke. This paradox has been recognized for nearly a century, although not explained. It may reflect some form of physiologic compensation, such as changes in erythrocyte diphosphoglycerate2,3 or reduction in physical activity because of compromised pulmonary function. Rare causes. Once the common causes of elevated hemoglobin concentration and hematocrit have been ruled out, consider the rare disorders that can produce this finding:High oxygen affinity hemoglobin variants, such as hemoglobin Malm or hemoglobin Kempsey.Polycythemia vera.Renal or hepatic tumors.Cerebellar hemangioma.Venous to arterial shunting, usually accompanied by cyanosis; this finding indicates a need for cardiac catheterization.When you suspect an obscure cause of elevated hemoglobin concentration and hematocrit, measure arterial blood gases. Normal arterial oxygen content and normal oxygen saturation of hemoglobin (typically 97% to 100%) are characteristic of high oxygen affinity hemoglobin variants, polycythemia vera, and erythropoietin-producing tumors. Low arterial oxygen content and oxygen saturation of hemoglobin are associated with severe pulmonary disease or erythrocytosis caused by a venous to arterial shunt. An elevated carbon monoxide concentration points to tobacco use or other environmental source of carbon monoxide. Cerebellar hemangioma can be excluded if the patient has no neurologic abnormalities, especially no ataxia. A brain scan is not needed. Erythropoietin-secreting tumors of the kidney or liver can be identified by very high levels of serum erythropoietin. In patients with polycythemia vera or high oxygen affinity hemoglobin variants, serum erythropoietin concentration is normal or low (except following phlebotomy or the spontaneous hemorrhage that often complicates polycythemia vera). Polycythemia vera is usually not difficult to diagnose. Obtain a complete blood cell (CBC) count that includes leukocyte and platelet counts (a reticulocyte count is not needed). Typical findings in patients with polycythemia vera are:Hemoglobin concentration greater than 19 g/dL (higher in those who live at altitudes greater than 1000 m above sea level; lower in women and in African Americans).Hematocrit greater than 59% (higher in those who live at altitudes greater than 1000 m above sea level; lower in women and in African Americans).Leukocyte count greater than 12 X 109 /L.Platelet count greater than 500 X 109 /L.Greatly enlarged spleen that is easily palpable below the left costal margin, except in very obese patients. CT or other imaging studies are rarely required to evaluate spleen size; slight splenic enlargement that is evident only in these studies is not a relevant finding.These features are unique to polycythemia vera. If the above criteria are met, a blood volume (red cell mass) study is not needed. When findings are equivocal, reexamination of the patient in 4 to 6 months usually clarifies the nature of the problem. In patients whose hemoglobin concentration, hematocrit, leukocyte count, and platelet count are borderline, there is no urgency to diagnose polycythemia vera because at this early stage of the disease there is no treatment that is either effective or appropriate. The principle of primum non nocere applies. When high oxygen affinity hemoglobin variants are the suspected cause of erythrocytosis, obtain a careful family history and CBC data from the patients parents, siblings, and children. These disorders exhibit classic Mendelian inheritance. Normal results on arterial blood gas studies (carbon monoxide, oxygen saturation) indicate a need for a study of the oxygen affinity of hemoglobin (P50 study). This test is available in many laboratories. An oxygen affinity curve with a hyperbolic appearance (rather than the normal sigmoidal configuration) and a P50 value less than 20 torr (mm Hg) (instead of the normal 25 to 30 torr) point to a high oxygen affinity hemoglobin variant. Follow up such results with studies to identify an abnormal hemoglobin concentration as the cause of erythrocytosis; these may include electrophoresis, isoelectrofocusing, amino acid sequence analysis, or DNA sequencing. To best determine which of these tests are appropriate for a given patient, consult with the director of a laboratory that specializes in such studies.

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**High h/h. H levels. High h and h symptoms. What does a high h and h mean. Low h and h levels. High-high level. H/h levels.**

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