

Reticulocyte Count

A reticulocyte count is done to see whether anemia is caused by fewer red blood cells being made or by a greater loss of red blood cells. Check to see if treatment for anemia is working. For example, a higher reticulocyte count means that iron replacement treatment or other treatment to reverse the anemia is working.

Reticulocytes

Reticulocytes are immature red blood cells, typically composing about 1% of the red cells in the human body. Reticulocytes develop and mature in the red bone marrow and then circulate for about a day in the blood stream before developing into mature red blood cells. Like mature red blood cells, reticulocytes do not have a cell nucleus. The reticulocyte count rises when there is a lot of blood loss or in certain diseases in which red blood cells are destroyed prematurely, such as hemolytic anemia. Also, being at high altitudes may cause reticulocyte counts to rise, to help you adjust to the lower oxygen levels at high altitudes.

They are called reticulocytes because of a reticular (mesh-like) network of ribosomal RNA that becomes visible under a microscope with certain stains such as new methylene blue. Reticulocytes appear slightly bluer than other red cells when looked at with the normal Romanowsky stain. Reticulocytes are also slightly larger, which can be picked up as a high MCV (mean corpuscular volume) with a full blood count done by a trained medical scientist, who has specialised in haematology, or a machine.

To accurately measure reticulocyte counts, automated counters that use lasers mark cell samples with fluorescent dye that marks RNA and DNA (such as thiazole orange).^[1] This distinguishes reticulocytes as the middle ground of dye response to laser light, between red blood cells (which have neither RNA nor DNA) and lymphocytes (which have a large amount of DNA, unlike reticulocytes).^[2]

The normal range of values for reticulocytes in the blood depends on the clinical situation and the lab, but broadly speaking is 0.5% to 1.5%. However, if a person has anaemia, their reticulocyte percentage should be higher than "normal" if the bone marrow to produce new blood cells remains intact. Thus, calculating the reticulocyte production index is an important step in understanding whether the reticulocyte count is appropriate or inappropriate to the situation. This is often a more important question than whether the percentage is in the normal range; for instance, if someone is anemic but only has a reticulocyte percentage of 1%, this means that the bone marrow is likely not producing new blood cells at a rate that will correct the anemia. The number of reticulocytes is a good indicator of bone marrow activity, because it represents recent production. This means that the reticulocyte count, and the reticulocyte production index that can be calculated from it, can be used to determine whether a production problem is contributing to the anaemia, and can also be used to monitor the progress of treatment for anaemia.

When there is an increased production of red blood cells to overcome chronic or severe loss of mature red blood cells, such as in a haemolytic anaemia, people often have a markedly high number and percentage of reticulocytes. A very high number of reticulocytes in the blood can be described as reticulocytosis.

Abnormally low numbers of reticulocytes can be attributed to chemotherapy, aplastic anaemia, pernicious anaemia, bone marrow malignancies, problems of erythropoietin production, various vitamin or mineral deficiencies (B9, B12, iron), disease states (anemia of chronic disease) and other causes of anaemia due to poor RBC production.

Results

A reticulocyte count is a blood test that measures how fast red blood cells called reticulocytes are made by the bone marrow and released into the blood.

Normal

The reticulocyte count is given as the percentage of red blood cells that are reticulocytes (the number of reticulocytes divided by the total number of red blood cells, multiplied by 100).

Normal values may vary from lab to lab. Results are ready in 1 day.

Newborns have a normal reticulocyte count of 2.5% to 6.5%. This value drops within 2 weeks to 0.5% to 2.0%.

Reticulocyte count	
Normal:	10–86 x 10 ⁹ cells per liter (cells/L)

High values

- A high reticulocyte count may mean more red blood cells are made by the bone marrow. This can occur after a lot of bleeding, a move to a high altitude, or certain types of anemia. These conditions cause red blood cells to break down (hemolysis).
- The reticulocyte count rises after the treatment for pernicious anemia, iron deficiency anemia, or folic acid deficiency anemia starts working.

Low values

- A low reticulocyte count may mean fewer red blood cells are made by the bone marrow. This can be caused by aplastic anemia or other types of anemia, such as iron deficiency anemia.

- A low reticulocyte count can also be caused by exposure to radiation, a long- term (chronic) infection, or by certain medicines that damage the bone marrow.

What can affect the Test

Reasons you may not be able to have the test or why the results may not be helpful include:

- Taking medicines, such as levodopa, corticotropin, azathioprine (Imuran), chloramphenicol (Chloromycetin), dactinomycin (Cosmegen), medicines to reduce a fever, medicines to treat malaria, and methotrexate and other cancer chemotherapy medicines.
- Getting radiation therapy
- Taking sulfonamide antibiotics (such as Bactrim or Septra)
- Being pregnant
- Having a recent blood transfusion

In anemia, the reticulocyte count will be abnormal because the levels of red blood cells and hemoglobin are low. Also, reticulocytes make up a higher percentage of the blood count in anemia, which makes the reticulocyte count falsely high. For this reason, a doctor will check the reticulocyte count along with the reticulocyte index (RI) when checking for anemia. The RI is a measurement for reticulocytes when anemia is present

A reticulocyte count may help a doctor decide other tests that need to be done to diagnose a specific type of anemia or other disease. A low reticulocyte count may mean a need for a bone marrow biopsy. This can tell if there is a problem with how new reticulocytes are made by the bone marrow.

1. Indication
 1. Anemia Evaluation
2. Contraindications
 1. Recent Transfusion (not diagnostic after transfusion)
3. Measures
 1. Reticulocyte Count
 1. Reticulocyte percentage of total erythrocytes
 2. Does not correct for degree of Anemia
 2. Absolute Reticulocyte Count (ARC)
 1. Number of Reticulocytes present in 1 mm³ blood
 2. $ARC = (\text{Reticulocyte } \%) / 100 * \text{Erythrocyte Count}$
 3. Reticulocyte Index (RI)
 1. Adjusts Reticulocyte Count for Hematocrit
 2. Reticulocyte Index reflects Bone Marrow activity
 1. Known as "Poor man's Bone Marrow Aspirate"
 3. Calculation
 1. $RI = \text{Reticulocyte Count} \times (\text{HCT} / \text{normal HCT})$
4. Interpretation
 1. Normal Reticulocyte Count: 0.5-1.5%
 2. Normal Reticulocyte Index: 1-3%
5. Reticulocytosis (Increased RBC Production)
 1. Criteria
 1. Reticulocyte Index >3%
 2. Reticulocyte Count >1.5%
 2. Conditions
 1. Acute blood loss or hemorrhage
 2. Post-Splenectomy
 3. Acute Hemolytic Anemia (Microangiopathic Anemia)
 1. Example: Autoimmune Hemolytic Anemia
 2. Usually $ARC > 100 \times 10^6/L$ and Retic Count >2%
 4. Hemoglobinopathy
 1. Sick Cell Anemia

2. Thalassemia major
5. Post-Anemia Treatment
 1. Folate Supplementation
 2. Iron Supplementation
 3. Vitamin B12 Supplementation
6. Reticulocytopenia (Decreased RBC Production)
 1. Criteria
 1. Reticulocyte Index $<1\%$
 2. Reticulocyte Count $<0.5\%$
 2. Conditions
 1. Aplastic Anemia
 2. Bone Marrow infiltrate
 3. Bone Marrow suppression or failure
 1. Sepsis
 2. Chemotherapy or radiotherapy
 4. Disordered RBC maturation
 1. Iron Deficiency Anemia
 2. Vitamin B12 Deficiency
 3. Folate Deficiency
 4. Sideroblastic Anemia
 5. Anemia of Chronic Disease
 6. Hypothyroidism
 5. Blood transfusion
 6. Liver disease