

Laura Hutton

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Blood Essay: Erythropoietin

Erythropoietin (EPO) is a hormone that regulates red blood cell production in the bone marrow. It is stimulated by a lack of oxygen and is created in the kidneys, which are very sensitive to oxygen levels. EPO is released when the oxygen levels are low in the kidneys. It then causes bone marrow to produce more red cells and increases the amount of oxygen the blood can carry.¹

The disorder closely tied to erythropoietin is polycythemia, which is defined by an excess of red blood cells. Polycythemia results from high altitude living, smoking, some cancers, pulmonary disease, and heart disease. It tends to be a symptomatic of another problem, it occurs only when the body is somehow deprived of oxygen.

Those who live in the mountains produce this hormone due to the lack of oxygen at high altitudes. Hypoxia is defined as the decline in the amount of oxygen in the blood.² This occurs when people are new to high altitudes. If someone were to visit Denver, Colorado they would experience hypoxia. The body would be unused to this change in oxygen supply and shortness of breath and fatigue could ensue. Swelling of the hands and feet and redness are also common.³

These symptoms are temporary. If the person stays in Denver, or any high altitude area, for a long period of time their bodies will begin to become accustomed to the lack of

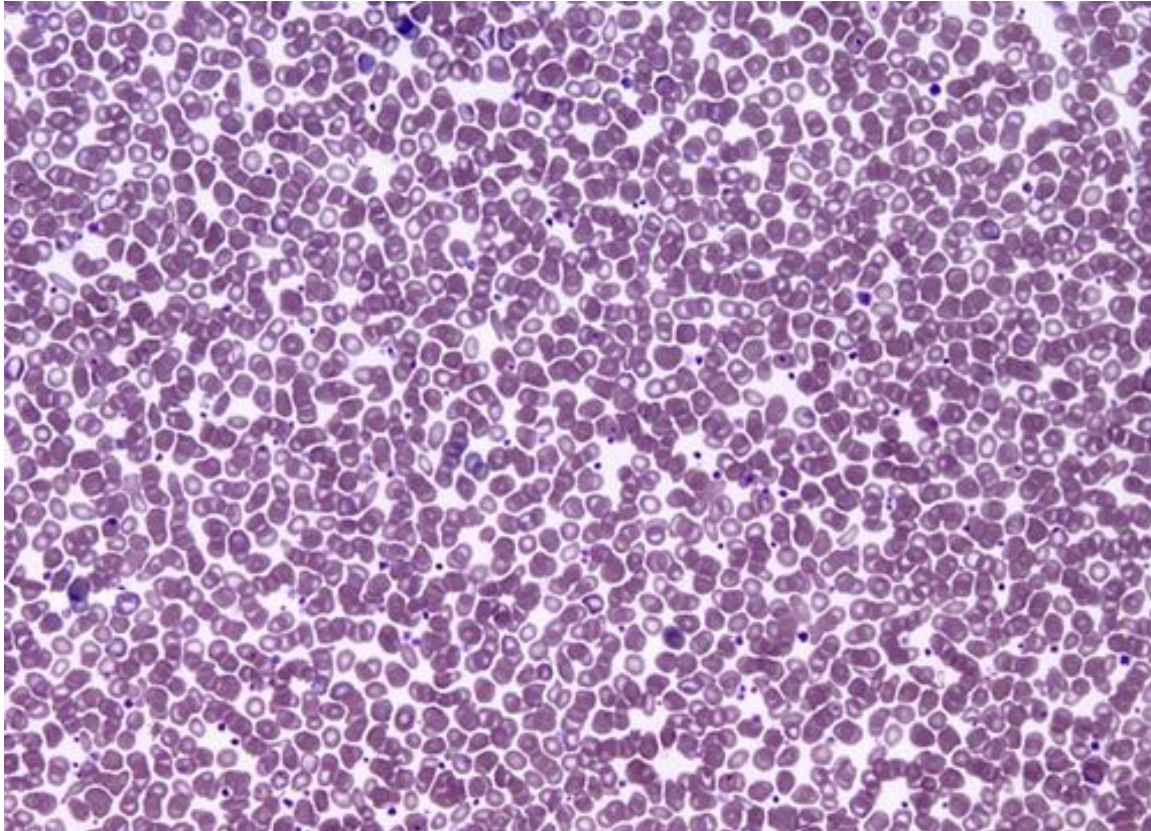
¹ <http://www.medterms.com/script/main/art.asp?articlekey=7032>

² <http://www.americanheart.org/presenter.jhtml?identifier=4618>

³ <http://www.americanheart.org/presenter.jhtml?identifier=4618>

oxygen and the kidneys will produce EPO and additional red blood cells will be formed. Thus, they will develop polycythemia.

Below is a slide showing polycythemia:



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Smoking decreases the amount of oxygen and thus polycythemia is common in heavy smokers. This is a problem with heavy smokers because if there is an eight-hour period between cigarettes, the blood oxygen level returns to normal.⁵ Therefore, those who are light smokers do not deprive the oxygen for long enough periods to develop polycythemia. On the other hand, those who smoke heavily create a constant rate of low oxygen and kidneys have to work harder to regulate this.

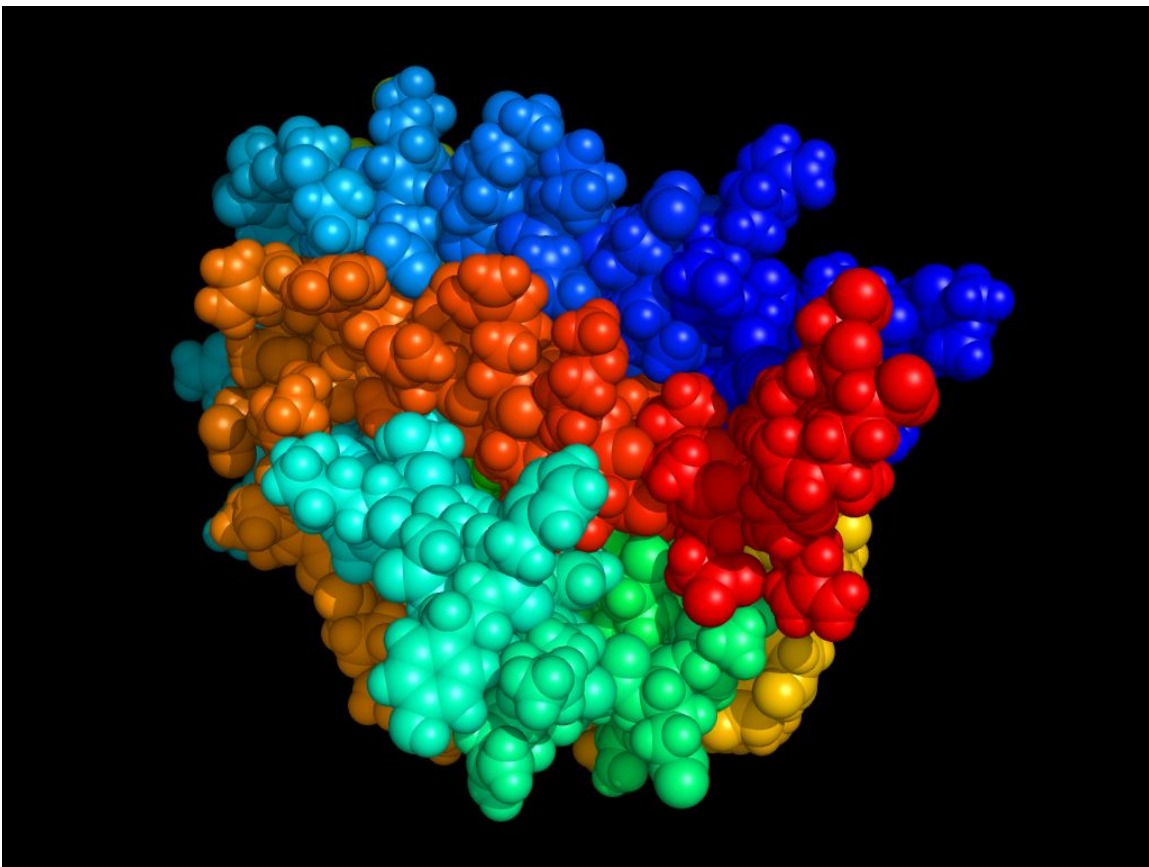
⁴ <http://www.microscopyu.com/staticgallery/pathology/images/polycythemia20x01.jpg>

⁵ http://www.irishheart.ie/iopen24/stopping-smoking-t-7_20_84.html?textsize=2

Some cancers decrease oxygen levels. Thus, polycythemia and an increase of erythropoietin levels can be helpful in leading to a diagnosis. Pulmonary disease and heart disease also impact the levels of oxygen leading to the release of erythropoietin.

Due to its increase during some cancers, pulmonary disease, and heart disease, erythropoietin can be a beneficial to determining a diagnosis and developing an early treatment plan. If polycythemia is detected prior to a prognosis, then it narrows the possible causes of the condition, making the cancer or heart problem easier to detect and treat.

Below is a picture of the structure of erythropoietin:



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⁶ <http://images.google.com> search: erythropoietin

Knowing the levels of EPO in the blood is important when studying bone marrow disorders and kidney disease.⁷ This is because it gives a reason for abnormal kidney function and increased production in the bone marrow. If the excess erythropoietin is unknown, then the number of disorders one can have are limited. Knowing the EPO levels is important to explain known diseases and diagnose unknown ones.

Since red blood cells are increased, polycythemia also causes a hematocrit increase.⁸ Due to the increase of red blood cells, the volume of these cells in the blood is impacted and increased. Thus, if an increase of hematocrit is detected, and excess of EPO should be checked as well as an increase of red cells.



Polycythemia:

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⁷ <http://www.medterms.com/script/main/art.asp?articlekey=7032>

⁸ <http://www.medicinenet.com/hematocrit/article.htm>

⁹ http://www.wellness.com/images/reference_data/ns/myeloproliferativedisorders.jpg

Works Cited

Definition of Erythropoietin. Medicinenet.com. 12 February 2001.

<http://www.medterms.com/script/main/art.asp?articlekey=7032>

Erythropoietin Image. <http://images.google.com>

Hematocrit. Medicinenet.com. 3 November 2008.

<http://www.medicinenet.com/hematocrit/article.htm>

High-Altitude Sickness. American Heart Association. 2010.

<http://www.americanheart.org/presenter.jhtml?identifier=4618>

Polycythemia image. Microscopyu.com.

[http://www.microscopyu.com/staticgallery/pathology/images/polycythemia20x01.](http://www.microscopyu.com/staticgallery/pathology/images/polycythemia20x01)

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Polycythemia image.

http://www.wellness.com/images/reference_data/ns/myeloproliferativedisorders.j

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Stopping Smoking. Irish Heart Foundation. [http://www.irishheart.ie/iopen24/stopping-](http://www.irishheart.ie/iopen24/stopping-smoking-t-7_20_84.html?textsize=2)

[smoking-t-7_20_84.html?textsize=2](http://www.irishheart.ie/iopen24/stopping-smoking-t-7_20_84.html?textsize=2)