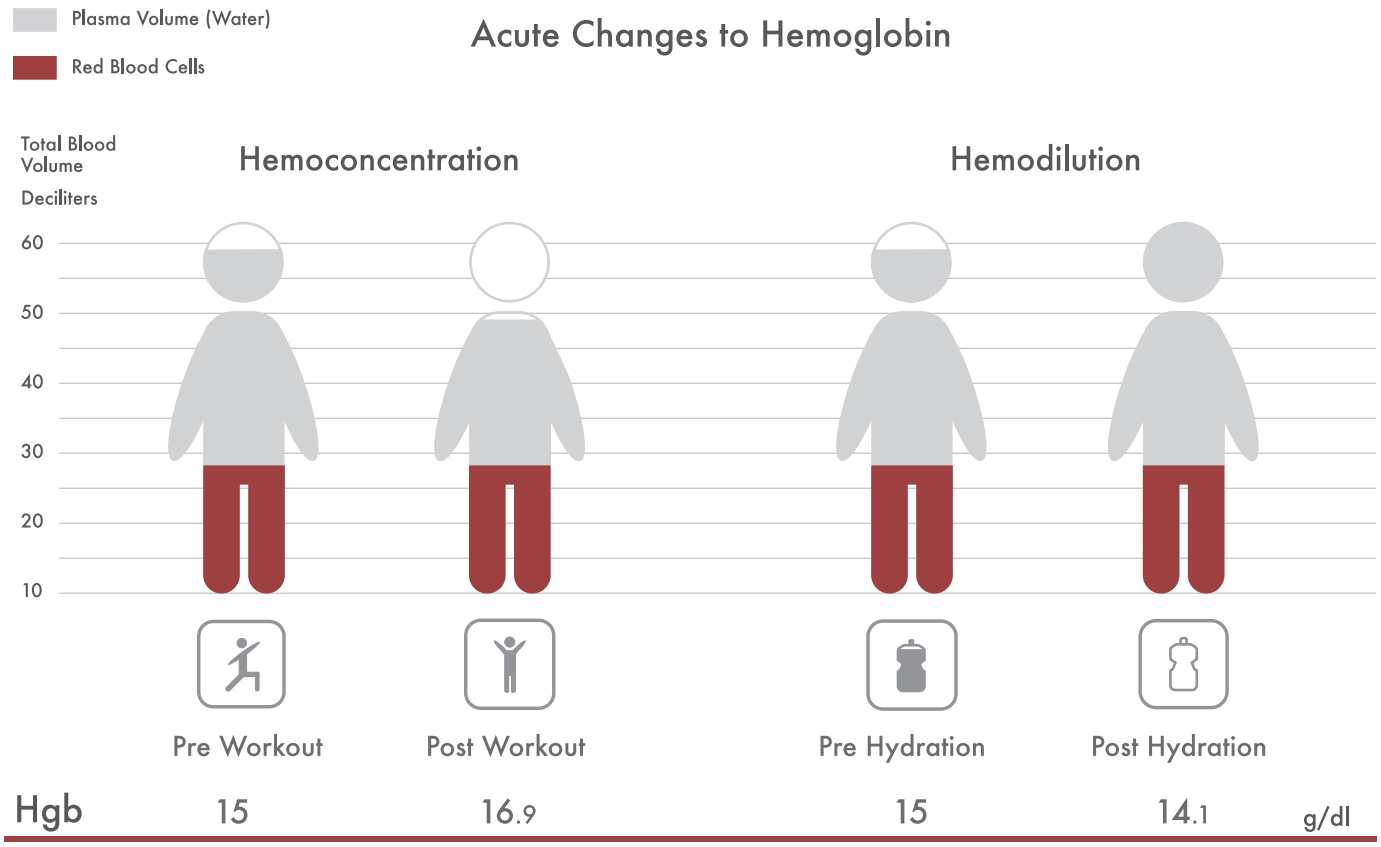
Exercise impact on hemoglobin levels

Exercise and training regimens can have a substantial impact on hemoglobin. In general, exercise alters hemoglobin in two ways: acute and chronic changes in the plasma (water component of blood), and the actual change in the amount of hemoglobin present. These changes can be seen in the short term (minutes to hours) or long term (days to weeks).

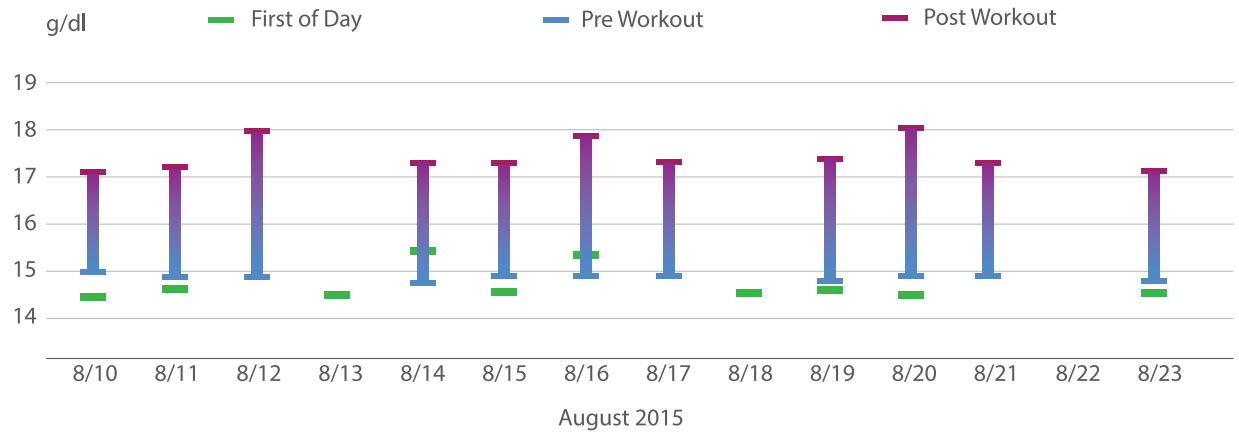
Because hemoglobin is a concentration, any shift in the amount of plasma can change its value. Plasma volume can decrease immediately upon initiation of intense exercise as a result of blood pressure increase, hormonal changes and sweating.[1] This decrease can raise hemoglobin in the short term and is known as hemoconcentration. Conversely, increased hydration, such as drinking water after exercise, can bring the hemoglobin levels back down in a process known as hemodilution.



Furthermore, long term changes in plasma and thus hemoglobin concentrations can also be seen in response to the type and duration of exercise regimens.[2,3,4,5] For example, it is noted that endurance athletes may have lower hemoglobin levels as their bodies chronically increase the plasma volume in response to exercise. Despite the increase in hemoglobin produced as a result of exercise, this overall increase in plasma volume causes hemodilution.[4,6] These hemoglobin changes observed with fluid shifts even led to the researchers Dill and Costill devising an equation, based on hemoglobin and hematocrit concentrations, to calculate the blood volume and plasma volume changes that have occurred.[3]

Production of hemoglobin itself can also be affected by exercise. In general, the production of red blood cells (RBC's), hemoglobin and release of RBC's into circulation increases in response to sustained training.[4] However, factors such as type of exercise, type of athlete, intensity of training and elevation at training can all impact the extent of this increase. For instance, it was noted in one study that within the athlete population, strength trained athletes had higher hemoglobin than endurance or mix-trained athletes.[6] Furthermore, "leisure-time" athletes had lower hemoglobin than competitive athletes.[6]

Clearly there are many factors that influence hemoglobin changes in response to exercise. As in many areas of human physiology, there also exists individual variation in responses as well. Thus the ability to non-invasively measure hemoglobin with Ember on a daily basis, or pre and post workout, has the potential to give athletes greater clarity into how their exercise regimen is impacting their hemoglobin levels.



Daily Ranges of Hgb as viewed within the Ember App

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