Skinny on the Buzz

Circulation and Cellular Oxygenation

When the authorities raided the living quarters of the Austrian ski team at the Winter Olympics 2006, they recovered a cache of blood doping paraphernalia. Needless to say, it cost the Austrians a skiing medal in Turin, Italy. This was not the first time, however, that highly accomplished athletes were caught red-handed rigging the game in their favor.

Some athletes participating in endurance sports—for instance, multi-stage bicycle racing and long-distance running—resort to blood doping to gain a competitive edge. If the oxygen-carrying capacity of the blood is increased, the aerobic respiratory capacity of the muscles is correspondingly elevated, making blood doping irresistible to some.

Blood doping likely gained greater interest with the availability of erythropoietin in the late 1980s. Erythropoietin (EPO) is a glycoprotein that circulates in the blood plasma in rather small amounts. It is synthesized primarily in the kidney where its production is triggered by low levels of oxygen in the circulating blood. Once produced, EPO initiates the bone marrow to produce red blood cells. When the oxygen levels in the blood reaching the kidney rise, EPO production is reduced. This is a fail-safe mechanism, which ensures that anemia, whatever its cause, does not take a toll on the body and its commerce. Anemia may ensue because of a chronic disease, or because of chemotherapy in cancer patients, or simply by reduced production of red blood cells, which carry oxygen. Localized anemia may also be a result of restricted blood flow to a given area in the body.

Typically, EPO is administered subcutaneously or intravenously under clinical supervision. Its therapeutic potential does have limitations; thus, it cannot be used in patients with uncontrolled high blood pressure. One of the rare but quite serious side effects of EPO is acquired pure red cell aplasia, an autoimmune condition in which the bone marrow loses the ability to produce red blood cells altogether, necessitating dependency on blood transfusions. This suggests that blood doping outside of a clinical context can have grim consequences. For one, increased numbers of red blood cells make the blood sufficiently thick to strain the heart, especially while sleeping, when the heart rate is low. This was gruesomely driven home in the 1990s when several elite cyclists met their demise while asleep. It should be noted that an increase in hematocrit—the proportion by volume of red blood cells of the entire complement of blood cells—beyond a certain threshold value is detrimental. This is because the oxygen carrying capacity of the blood is actually reduced, recapitulating symptoms similar to chronic mountain sickness.

Not to be besotted with the stigma of unbecoming behavior to thwart fair competition, many athletes have increasingly begun to look for natural alternatives to improve their stamina by increasing cellular oxygenation without pharmaceutical means. A few nutritives are claimed to enhance cellular oxygenation, chief among them being vitamin B12. Citrulline, an amino acid, provides a more reliable and less cumbersome option. Abundantly found in watermelon, citrulline enhances blood circulation by making the smooth muscle cells in the vasculature more flexible; this, in turn, ensures that cellular oxygenation is improved throughout the body. For more information on citrulline, visit www.naturallyvitamins.com.
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