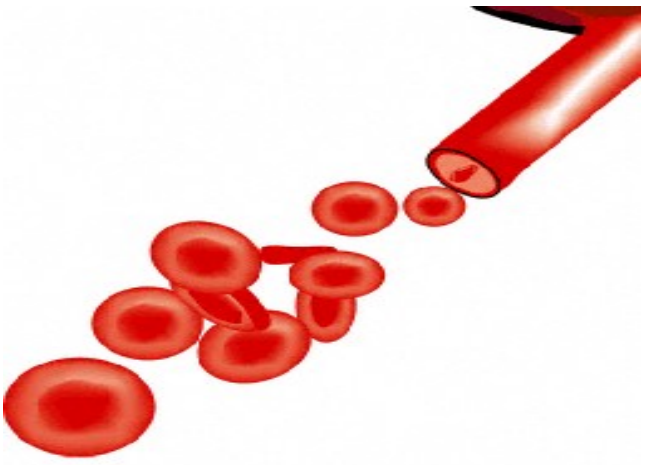
Using Oxygen to Better Performance

Using simulated altitude for increased performance. Live high, train low is believed to be the best method for increasing sport performance for the trained athlete. Altitude training has athletes train at high altitudes, but the positive benefits were canceled out because the lack of oxygen limited the intensity of training. You can benefit from training at high altitudes, but it is more beneficial to return to sea level for high intensity training where oxygen is more available.

So training at altitude makes you reach your lactate threshold quicker hurting your overall intensity. But by exposing yourself to high altitudes your body makes more red blood cells which increases oxygen intake for your lungs and bloodstream. The more red blood cells the more oxygen to fuel the muscles. The reason more red blood cells are formed at altitude is due to the hormone EPO. *Erythropoietin (EPO): A hormone produced by the kidney that promotes the formation of red blood cells in the bone marrow. EPO is a glycoprotein (a protein with a sugar attached to it). The kidney cells that make EPO are specialized and are sensitive to low oxygen levels in the blood. These cells release EPO when the oxygen level is low in the kidney. EPO then stimulates the bone marrow to produce more red cells and thereby increase the oxygen-carrying capacity of the blood.* This results in an increased VO2 max- *the max amount of oxygen that your body can convert to energy.*



Here is a short explanation of ATP, lactic acid and oxygen consumption:

When the body doesn't have enough oxygen to breakdown pyruvate then lactate is formed. Lactate (lactic acid) can be re synthesized to form ATP without oxygen, the process is called anaerobic glycolysis (transformation of glucose to lactate when limited amounts of oxygen are available) but through this process a hydrogen ion (H+) is formed decreasing blood pH. ATP (Adenosine Triphosphate) is the source of energy that keeps everything going in the body. ATP is an adenine nucleotide bound to three phosphates. When a cell needs energy, it breaks this bond to form ADP (adenosine diphosphate) and a free phosphate molecule. A H+ is also released during this process and causes a decrease in blood pH. Once the body can't keep up with the build-up of H+, the acidic environment begins to impair muscle contractions. The burn you feel is due to nerve endings being stimulated by the low pH. When this occurs you have reached your lactate threshold. (In depth explanation of lactic acid http://www.brianmac.co.uk/lactic.htm)

The synthetic version of EPO works at the cost of stroke or heart attack and studies

have shown high/low training works with no adverse side effects. Why am I wasting your time with this and what does this have to do with CrossFit? Well the common denominator seems to be intensity. More oxygen to the system provides more energy. So would breathing a higher concentration of oxygen while working out allow better performance which in turn pushes the body into further adaption?

Why, yes it will according to studies done by University of Florida using 20 healthy male athletes split into two groups: trained and highly trained.(finally people doing fitness studies on trained athletes) The highly trained athletes using a slightly hyperoxic condition (26% oxygen instead of standard 21% oxygen) were able to elevate VO2 max from 70.1 to 74.7 but the trained athletes with VO2 max of 56.5 saw no changes. The hyperoxic breathing seems to be most effective once you approach your limitations.

Another study conducted by the University of New Mexico using trained athletes testing the effects of higher oxygen concentration for better, high-intensity interval performance. After 6 weeks of hyperoxic training (70% oxygen) the athletes showed considerably improved performance. Endurance levels while pedaling at 85% of max workload increased by 32% after six weeks, and heart rate during high intensity cycling declined by around five beats per minute.

Owen Anderson said,

"The New Mexico scientists speculated that – among other things – the hyperoxic training may have boosted the blood volumes of the athletes. A rise in blood volume is one of the key adaptations to endurance training, and intensity – not the number of workouts per week or the total duration of workouts – is its most potent trigger; that's because high-intensity workouts stimulate special tubules within the kidneys to hold onto more plasma, thus thwarting the kidneys' perverse desire to literally waste fitness. The resultant increased quantity of blood permits more red fluid to reach athletes' muscles during exercise. More blood means the muscles get more oxygen, and more oxygen translates into greater energy production and improved performance."

In conclusion due to the growth of CrossFit Games and the potential to make money competing, everyone is looking for ways to get a slight edge over the competition (legally and without using controlled substances). Your options are limited but we have explored a few here. Hypoxia machines run between $1500 and $2500, using one of these allow you to sleep at altitude and train at sea level (or close to it if you live on the coast) or hyperoxic using a higher concentration of oxygen (estimated start-up cost $150). The latter of the two is the most affordable and best option. Training under hyperoxic conditions enables you to work at faster-than-usual speeds sustained for unusually long periods. This higher-intensity workout drives more adaption making you fitter in normoxic environments upping your overall performance.

Read on if you are the type that needs me to hold their hand and tell you ways to incorporate hyperoxic training into your program. First buy oxygen tank and mask at medical supply store. Second join a CrossFit gym that allows you to program your own workouts, (ex. Sparta Fitness) then 2 to 3 times per week do some type of interval training at maximum effort like rowing (tabata or any other interval) or wallballs or squats or any exercise you want to improve VO2max (since it is sport specific) and your hose and oxygen mask don't get in the way. A tabata this! could be done or even Grace or Isabel if you clipped the hose behind you. Best of all use your imagination and be creative.