ACE-COMMISSIONED STUDY

Drinkable Oxygen?

New Study Investigates Super Oxygenated Water Claims

By Mark Anders

The Claims:

Aqua Rush (aquarush.com):

"…dramatically elevates the levels of dissolved oxygen in the water…ten times higher than the tap water you are drinking at home."

"…Promotes extra energy; Increases blood oxygen; Reduces pulse rates; Promotes alertness; Increases stamina; Improves digestion…"

Athletic Super Water (anewlife.co.uk/oxygenized-super-water.html):

"Oxygen content of Athletic Super Water is up to seven times higher than that of regular bottled water and up to 10 times higher than normal tap water."

"…perfect for the athlete looking for a competitive edge or anyone who wants to be truly healthy."

SerVenRich (servenrich.com):

"SerVenRich is bottled with 800% more pure oxygen than ordinary water."

"…Promotes higher energy levels; Maintains greater mental awareness and concentration…"

"'It's the water my daughters, Serena and Venus, rely on during their training,' Richard Williams said. 'It offers them the oxygen they need while on the court, as well as water without that bitter aftertaste. It's our preference.'"

AquOforce (aquoforce.com):

"AquOforce delivers what no other oxygenated beverage can, over 4000% the oxygen of normal bottled waters."

"… More Energy; Mental Sharpness; Faster Recovery Time; Less Fatigue; Improved Performance …"

Super oxygenated waters, sold under brand names like Aqua Rush, Athletic Super Water, SerVenRich and AquOforce, boast up to ten times more O_2 content than normal tap water. And more is better, right? Advertisements say the body absorbs the extra O_2, resulting in improved stamina and athletic performance, reduced recovery time, and better mental clarity. So ACE enlisted the Human Performance Research Lab at the University of Wisconsin, La Crosse to test those claims and compare the physical performance effects of super oxygenated water, which range in price from $1.00 to $2.50 per ½ liter, to those of regular tap water.

The Study

Led by John Porcari, Ph.D., the research team recruited 12 healthy, college-aged women and men to participate in the study. Separated into two groups of six, subjects were randomly assigned to drink either 16 ounces of super oxygenated water or regular tap water. [Note: researchers chose to use Aqua Rush Oxygenated Water for this test because it is one of the most readily available products for consumers.]

After drinking the assigned type of water, subjects sat quietly in a chair for five minutes while researchers measured heart rate, blood pressure, blood lactate and oxygen consumption. Next, each subject performed a multi-stage $\dot{V}O_2$max test on a treadmill. At the end of each stage (and at maximal exertion), heart rate, blood pressure, ratings of perceived exertion (RPE) and oxygen consumption ($\dot{V}O_2$) were recorded. Blood lactate was also measured at key times throughout the test. One week later, subjects returned to the laboratory and completed the same protocol using the opposite condition (i.e., drinking the other type of water).

Ahead of His Time

In 1774, when scientist Joseph Priestly first isolated oxygen he noted, "The feeling of it to my lungs was not sensibly different from that of common air; but I fancied that my breast felt particularly light and easy for some time afterwards. Who can tell that in time, this pure air may become a fashionable article in luxury."

The Results

Researchers found that drinking super oxygenated water had no measurable effect on the subjects' resting heart rate, blood pressure or blood lactate values. Similarly, there was no effect on heart rate, blood pressure or blood lactate values during either the sub-maximal or maximal exercise tests.

A second maximal test was conducted immediately following the first test to investigate the effects of super oxygenated water on exercise recovery. If additional oxygen had, in fact, been absorbed in the blood stream and delivered to the tissues, there should have been measurable reductions in sub-maximal exercise heart rates and blood lactate values, and increases in maximal oxygen consumption during the second test. Apparently, the blood oxygenation levels were either not elevated at all or not elevated sufficiently to affect oxygen delivery to the tissues or tissue metabolism.

Researchers also conducted a dissolved oxygen analysis on three bottles of Aqua Rush and three bottles of SerVenRich. Results revealed that both types of super oxygenated water contained less than three times the amount of oxygen found in normal tap water (See sidebar, below right).

The Bottom Line

At this time, there is no scientific evidence or logical rationale to suggest that drinking super oxygenated water can in any way increase the amount of oxygen in the blood stream. Therefore, any potential benefits of super oxygenated water would undoubtedly be attributed to the placebo effect. "The bottom line is that this stuff is no more beneficial than regular tap water," says lead researcher John Porcari, Ph.D. "The physiological mechanism is not there to get any potential benefit from the extra oxygen. There's just no physical way this product can improve blood oxygenation."

They could pump a thousand milliliters of oxygen into the water but there's still no physiologic mechanism to get that oxygen in the blood stream where it can be used.

Porcari says the results of the study were not a surprise to the researchers. There are only two possible ways to carry oxygen in the blood: Oxygen is either bound to hemoglobin or dissolved in the plasma. "In normal healthy exercisers, hemoglobin is already 97 to 98 percent saturated with oxygen," explains Porcari. "Obviously, there is very little room to improve upon this factor." And the only known way to increase the amount of oxygen dissolved in the blood is to increase the partial pressure of oxygen in the lungs by breathing either hyperoxic (higher percentages of oxygen) or hyperbaric (greater pressure than found within the body) oxygen mixtures during exercise. Both techniques have shown increases of dissolved oxygen in the plasma and have resulted in lower exercise heart rates, lower blood lactate values and higher maximal oxygen consumption values. However, this technique is only valuable during exercise and not beneficial if done pre-exercise or during recovery.

In addition, Porcari notes that the super oxygenated water must first be ingested and absorbed in the gut. Even if the oxygen is absorbed, he explained, it would have to be absorbed into venous blood. As soon as it passes through the lungs for the first time, the blood would either release the oxygen at the alveolar membrane or, more likely, not pick up as much additional oxygen.

Although the researchers studied and analyzed only two different brands of water, Porcari is confident all of the super oxygenated waters on the market would provide similar results. "I don't think it makes much difference how much oxygen the water contains," says Porcari. "They could pump a thousand milliliters of oxygen into the water but there's still no physiologic mechanism to get that oxygen in the blood stream where it can be used."

Research Team: John Porcari, Ph.D., Nancy Willmert and Carl Foster

The Theory Behind Super Oxygentated Water

The theory by which super oxygenated water is proposed to work is based on the fact that proper levels of oxygen are needed to support functional activity and exercise levels. "The idea here is that if you can provide more oxygen to the tissues, then the muscles can use it to create energy," says Porcari. "If your blood is carrying more oxygen, then it doesn't need as much blood to be pumped to do the job. And that should result in lower heart rate and blood pressure."

Any activity lasting longer than two minutes, especially prolonged exercise, depends on the oxidative energy system to produce enough ATP (a high-energy phosphate molecule) to fuel the activity. The oxidative energy system allows the pyruvate that had been originally produced by glycolysis to cycle through the Kreb's cycle and the electron transport chain. In the electron transport chain, high-energy electrons are stripped off of hydrogen and accepted by oxygen, allowing ATP to be produced. If oxygen is not readily available during metabolism, none of this could occur. The manufacturers of super oxygenated waters claim that if you can increase the availability of oxygen in the plasma, an increase in physical performance will result.

For proof of results, some super oxygenated water manufacturers point to a 1997 study conducted at Texas Women's University. In the study, researchers found that after long-distance runners drank oxygenated water, they ran a five-kilometer time trial an average of 15 seconds faster than after drinking regular bottled water. However, Porcari notes that the subjects were not blinded to the order of presentation of the waters so it is likely that the placebo effect had a strong bearing on the results. Also, the decrease in time that occurred only constitutes about 2.5 percent of the total time—a decrease that was not stated as being statistically different and still within the range of normal day-to-day variability.
[Note: the Texas Women's University study was not published in a peer-reviewed journal.]

What's Really in the Water?

Researchers conducted a dissolved oxygen analysis on three bottles of Aqua Rush and three bottles of SerVenRich. The test results revealed that the oxygenated waters contained less than three times the amount of oxygen found in tap water—markedly lower than advertised.

WATER SAMPLE	DO (MG/L)
Aqua Rush (sample 1)	18.10
Aqua Rush (sample 2)	18.20
Aqua Rush (sample 3)	17.90
SerVenRich (sample 1)	17.40
SerVenRich (sample 2)	16.90
SerVenRich (sample 3)	16.60
Normal tap water	7.1