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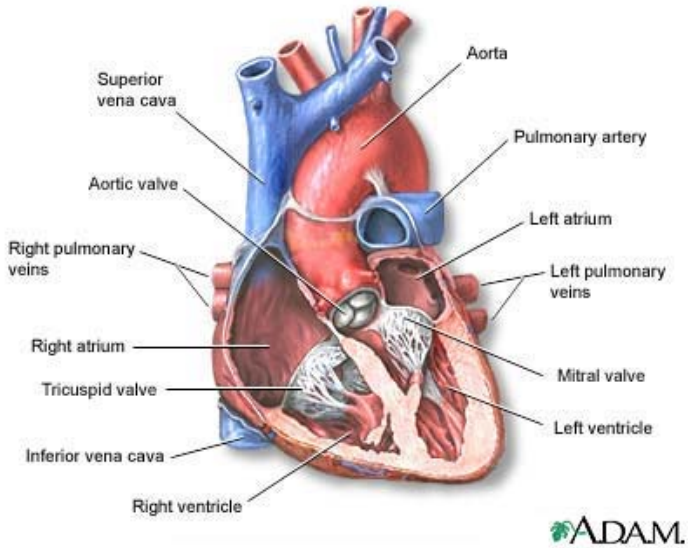
The Journey of an Oxygen Molecule

Even before he sets himself in place, the pulse of this athlete has already increased (competitive excitement and tension produces adrenaline, causing a slight rise in blood pressure, body temperature, pulse rate, and velocity of blood movement through the body). He has only exerted himself mentally at this point (psyching himself into preparation to win the gold – he has practiced long and hard for this), so let's take a peek inside to see what happens as he takes a deep breath, runs, and prepares to launch himself off the board across the long jump pit. We'll follow Mr. O'Too (0_2) through the athlete's body from the right lung to the right leg muscles, describing what happens along the way. Hang on tight – here we go!

Having just been deeply inhaled into the lung (a process known as inspiration), we can see Mr. O'Too awaiting his ride in the *Capillary* area of the Lung, where he has just diffused into an *Alveolar Sac* to begin his journey. There is his taxi now – an *Erythrocyte (Red Blood Cell, or RBC)*, swinging through having just traveled the *Right Pulmonary Artery* Freeway via the *Right Ventricle* of the athlete's heart (which is a very busy place). Mr. O'Too leaps aboard the RBC, exchanging places with his mother's brother's sister's



cousin twice removed, Miss C. O'Too (CO_2). Within the rather tired-looking haemoglobin of the RBC, he forms oxyhaemoglobin, thus causing the cell's bright red blush to return (98.5% of O'Too's relatives travel this way, the remaining 1.5% preferring to travel in solute form via blood plasma). With a whoosh Mr. O'Too is speeding towards the heart through the *Right Pulmonary Vein* (the only veins in the body to transport oxygenated blood). He pauses momentarily in the *Left Atrium* awaiting the next opening of the *Mitral Valve*, whereupon he is deposited into the *Left Ventricle* (*diastolic phase*) as the *Atrium* contracts, followed by the closing of the valve again. This prevents him from being 'backflushed' into the *Atrium* (which would cause quite a traffic jam). The *Left Ventricle* without delay contracts (*systolic phase*), opening the *Aortic Semilunar Valve*, pushing Mr. O'Too (and all his relatives) into the *Aorta*, where he promptly bangs a hard turn round the *Aortic Arch* onto the *Descending Aorta* Expressway.

The athlete's leg muscles are sending strong signals for more oxygen, causing an increase in respiration and metabolic activity. Meanwhile, the RBC carrying Mr. O'Too hastens along the *Iliac Artery*, branching off at the *Right Femoral Artery* then to the *External Iliac Artery* (a bypass around the organs of the pelvic cavity) to reach the final destination: the *Biceps Femoris* (running from under the *Gluteus Maximus* to the back of the knee). Once in the right neighborhood, the RBC carrying Mr. O'Too winds its way through various *arteries*, *arterioles*, and eventually into the narrowest passages of the *capillary bed* within the muscle, increasing in speed as the openings get smaller and smaller. Finally, at the very end of the road, Mr. O'Too disembarks the RBS, diffusing from the blood to muscles cells through the capillary wall, and wouldn't you know that this time his father's sister's brother's cousin three times removed, Davie C. O'Too (CO_2), takes his seat on the RBC for the return trip to the lungs. At the same time, heat is transferred from the blood into the tissue, and the athlete flushes (dilation of vessels very near the surface of the skin) and begins to perspire as the result of this exertion.

All the while this oxygen molecule has been traipsing around the body, the heart has been busily beating at an increased rate to ensure a supply of freshly oxygenated blood to the body, which is working harder than usual. Electrical impulses generated by the *Autonomic Nervous System* (from the Cardiovascular Center of the brain) regulate cardiac contractions, increasing the heart's activity in order to meet the metabolic needs of the athlete. Since the athlete is not at rest (laying on a couch watching his favorite television show, *Survivor*), the *Parasympathetic Nervous System* takes over to stimulate the heart's nerves and fibers, causing more forceful and rapid contractions. *Baroreceptors* help adjust and maintain blood pressure (through *vasodilation*) within normal limits while all the activity is taking place.

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