Construction of Oxygen Permeable Vessels Stage 2: Impact of Cellulose Fiber Lengths on Structure and Functionality

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Finding new methods of oxygenation is an important pursuit in the modern age of respiratory diseases, climate change, and the COVID pandemic. Individuals who struggle to achieve sufficient levels of oxygenation are often too weak to undergo high-risk procedures such as ECMO (extracorporeal membrane oxygenation) and require safe alternatives. Internal oxygenation is a task that many have attempted but continues to be a challenge due to the increased safety risks and mediocre success rates. The purpose of this project is to expand on the novel idea of creating biogel vessels capable of initially oxygenating bodies of water to levels theoretically capable of supporting fish life using methods that offer further potential for oxygenation of the human organism. To achieve the initial goal, a very large amount of oxygenation in a short period of time is required for success. This goal is complicated by the process of creating these biogel membranes, in which the cellulose source material absorbs chemicals. Chemical absorption may shrink the fibers and impact the full capacity of permeability. Consequently, the next step in this project became determining how using a material with longer fiber lengths would impact the diffusion of oxygen. Additionally, this project considers the structural integrity of the vessel construction with a focus on the ease of tube formation as well as stability during and after implementation. Thus, in this experiment, different fibers of varying lengths, thicknesses, and textures were tested to determine which is most compatible.

Awards Won:
Missouri University of Science and Technology: Summer Camp scholarships (camp tuition and travel expenses, valued at up to $1,500)
University of Texas at Dallas: Back-up scholarship recipients