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Separation of Nucleic Acids using pH

Blood-based biomarkers are critical to early diagnosis of diseases like cancer and Alzheimer's. These specific biomarkers of interest are nucleic acids called microRNA. However, they are both inefficient and costly to separate out of the blood and then amplify to a quantifiable amount. The focus of this project was to separate out microRNA based on their size, in order to effectively isolate the desired biomarkers. This was accomplished using a series of charged membranes functionalized with the amine groups of chitosan. The greater negative charge of larger DNA/ RNA causes it to travel slower through the chitosan membranes; similar to the how the size of a magnet affects its charge. A consistent baseline, or starting line, was created by having the first membrane functionalized with a higher concentration of chitosan. This baseline greatly increased the effectiveness of the nucleic acid separation by centralizing the initial binding of nucleic acids to a smaller and more precise area. Additionally there was a correlation of size to time, such that larger nucleic acids migrated slower. Future work would be to use fluorophores to test multiple sizes of nucleic acids at the same time, and to optimize the procedure for producing the higher concentration chitosan membranes.