Multiplexed Optical Detection of Heavy Metal Contaminants in Plants

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In the Narragansett Bay ecosystem there are various types of plant life and soil that allow the sea life to remain healthy and prospering. Within these plants there are heavy metal contaminants that threaten to disrupt this ecosystem. Absorbance spectroscopy and inductively coupled plasma-mass spectroscopy are two methods that can be used to detect such contaminants, however they are time consuming and expensive to produce on site testing. Single-walled carbon nanotubes emit long-lasting near-infrared (n-IR) fluorescence that can be examined using N-IR fluorescence spectroscopy. These nanotubes are ideal biosensors in that they are photostable, and shift fluorescence in the presence of analytes including but not limited to heavy metal ions. Here, using the basis that plants can internalize single walled nanotubes we will use an n-IR fluorescence microscope to observe and quantify exactly how the nanotubes fluorescence varies with the addition of heavy metal ions. Upon binding of the heavy-metal ion to the nanotube complex a characteristic red shift is expected to occur in the n-IR emission spectrum as the wavelength that the nanotube fluoresces at increases. Once this is controlled these nanotubes will be optimal nanosensors to inject into the plants and detect the concentration of the heavy metal ion contaminants.

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