Detecting Counterfeit Pharmaceuticals through UV Spectrophotometry

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According to the World Health Organization between 10%-30% of medicines, in Africa, Asia and South America, are counterfeit or sub-standard, affecting the health of millions of people. Currently, there is no effective way to check the quality of a medicine at the point of care, leaving many with treatable diseases at risk. The goal of this study is to identify UV-Vis (240nm - 500nm) absorbance patterns that would indicate if a drug is sub-standard or counterfeit. UV-Vis spectroscopy was selected as the method for testing due to the maturity and availability of the technology. Pure Acetaminophen and Tylenol were used as controls for proof of concept. Samples were prepared by dissolving different combinations of the pure active ingredient and adulterants such as cement, rice flour, vitamin C and lactose in three different types of solvents (H2O, 0.1 M HCl, 0.1 NaOH). Various concentrations (ranging from 0.01mg/ml to 0.04mg/ml) and mixing ratios were analyzed using a UV-Vis Spectrophotometer. It was found that adulterants significantly decrease the absorption of acetaminophen at 245nm by interacting with its benzene ring, while showing a slight increase in other parts of the spectrum. UV-Vis scans show that the amount of change in absorbance at specific wavelengths, coupled with characteristic wavelength shifts produced by different solvents, can be used for detection of counterfeit drugs. The methods presented here could be used for quality control of medicines at or near the point of care in parts of the world at higher risk of encountering defective pharmaceuticals.

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