

Determination of Concentrations of Glucose and Human Serum Albumin in Mixtures in Phosphate-Buffered Solution by Near-Infrared Spectroscopy

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Near-infrared (NIR) absorbance spectra of glucose and human serum albumin (HSA) mixtures in phosphate-buffered solution (PBS) (pH=7.4) were investigated as the basis of reagentless blood constituent measurements. Diffuse reflectance spectra of powdered glucose and HSA were also studied. Differential absorbance spectra taken relative to the spectrum of a reference PBS were measured in the wavelength range of 750–2,500 nm. In the differential spectra of mixture sample solutions, positive peaks corresponding to the HSA concentration could be observed, particularly in the range of 2,150–2,350 nm; however, peaks corresponding to the glucose concentration could not be observed. Some peaks visible in the diffuse reflectance spectra of powdered HSA could not be observed in the differential spectra. Measured NIR spectra were subjected to partial least-squares regression and good predictions of both HSA and glucose concentrations were obtained. Calibration for glucose in the concentration range of 0–300 mg/dl yielded a correlation coefficient of 0.9965 and a standard error of prediction (SEP) of 8.3 mg/dl with a latent variable of five. Calibration of HSA within the range of 2–4 g/dl yielded a correlation coefficient of 0.9996 with a SEP of 0.023 g/dl and a latent variable of five. These results suggest that reagentless measurements of glucose and HSA concentrations in human serum are possible with NIR spectroscopy.

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