Review on 25 years of IR-spectroscopy in clinical chemistry: Blood and cell-free body fluids

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Assays for biotic fluids based on infrared spectroscopy are of great interest, because they are reagentless and allow the simultaneous analysis of several components. There are several different measurement techniques applied routinely to blood and derived fluids such as plasma, serum and dialysates. In particular transmission and attenuated total reflection (ATR) measurements have been reported [1-5]. Samples can be fluids or dry-films prepared by water evaporation. Meanwhile, even continuous measurements for bed-side patient monitoring have been successfully developed [6-9].

Whereas whole blood has been successfully analyzed for metabolites such as glucose, there are larger molecules which are only to be found in the plasma phase and are absent within the cellular components, so drastic haematocrit dependent effects of inhomogenously distributed analytes on the quantitative ATR spectroscopy of whole blood can be observed. Sedimentation of erythrocytes is certainly another factor to be taken into account. The spectral analysis of whole blood spiked with different amounts of hydroxyethyl starch, used most frequently as a blood volume expander and considered as a model compound for blood substrates of high molecular mass, was undertaken using the ATR technique. There are different effects including deviations from absorbance linearity, which have been successfully modelled. On the other hand, using transmission cells of micrometer thickness, continuous whole blood measurements suffer from adhesion of leucocytes. Despite some of these drawbacks, novel devices based on quantum cascade lasers may further revolutionise these measurement techniques.

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