POSTER - SYSTEMS BIOLOGY AND MODELING

QUANTIFICAÇÃO DE BILIRRUBINA TOTAL POR METODOLOGIA DE CROMATOGRAFIA DE FLUXO LATERAL

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Bilirubin is a pigment metabolite that serves as a liver marker. Could be used to evaluate liver function. This metabolite is coming from Red blood cell degradation, associated with direct liver damage or dysfunction. It has been noted that the organ makes part of the bilirubin pathway.

Bilirubin quantification can be performed through venipuncture. It can be achieved using biochemical methods that determine the concentration of total bilirubin as well as its fractions. This enables the measurement of the specific pathway where the problem lies. When altered values ??of bilirubin are found in the whole blood, there is a diagnosis of hyperbilirubinemia and this condition is known as jaundice. But, biochemical methods require a high amount of blood that could be obtained only with venipuncture. To measure, a calibrated laboratory reader is required, and these devices are fail-safe when the analyst is not trained to complete the measurement and realize the diagnosis. The sample procedure also could generate a concentration bias, since the pre-analytical stage is crucial for the correct quantification of the analyte.

In comparison, another method was utilized in the hospital routine. The transcutaneous analysts could quantify the bilirubin by skin pigmentation. It's a less invasive method and Point of Care, but it depends on phenotypic factors, which may significantly interfere with the result.

The prototype created in this study aims to generate a rapid and accurate diagnosis similar to the biochemical method, while being minimally invasive, using portable laboratory knowledge and artificial intelligence. The collection would be done through capillary puncture, with quantification performed using the Hilab Flow device (Hi Technologies, Curitiba-PR), by processing the image and interpreting the serum coloration through reading in a visible spectrum (565 to 590 nm). This process can be carried out by assembling a new laboratory device that directly quantifies the pigment in an inert matrix, capable of changing color according to the concentration. Visualization occurs after separating the solid and liquid phases of the blood, and the pigment flows through capillarity in a membrane.

After collection and sample processing to be read in the device, the artificial intelligence analyzes the image through the color space RGB, XYZ or HSV. The quantification is made by the method standardization using mathematical concepts like color mean and median shown in the matrix. After setting a regression curve to calibrate the device, it becomes possible to quantify the bilirubin in the sample.

As for the results, the laboratory prototype has successfully passed the repeatability test, demonstrating a coefficient of variation of less than 3% in the control sample and the selected parameter. Currently, efforts are being made to construct a calibration curve that will enable the prototype to detect concentrations below, between, and above the reference value for both adult and neonate humans. This will extend the dynamic range of quantification.