Serum Absorption Spectral Scan: A digital marker of individuals identity

Edelbert Anthonio Almeida[1], Mohit Mehndiratta[1], Archana Nimesh[2], Seema Garg[1], Rajarshi Kar[1]

From the [1]Department of Biochemistry, University College of Medical Sciences and Guru Teg Bahadur Hospital, Delhi 110095, India, and [2]Department of Biochemistry, AIIMS Bathinda, Punjab 151001, India.

Correspondence to Dr Mohit Mehndiratta, Professor, Department of Biochemistry, University College of Medical Sciences, Delhi 110095, India.

drmohitucms@gmail.com; **ORCID iD**: *0000-0002-0822-6544*

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Abstract

Every individual is known to have a unique set of prints which can be used as identity tags. Fingerprints and genomic prints are widely used in medical and forensic applications. Serum/plasma of an individual has been postulated to be unique to an individual, however not many studies are available. This article sheds light on serum absorption spectral scan as a blueprint of an individual.

Keywords: Identity, Spectral Scan.

Each individual is known to have a distinct set of prints which serves as a unique marker of identification.[1] Fingerprints are known to be unique for every individual due to differential growth and pressure within the womb.[2] With advances in technology and molecular techniques it was later shown that every individual has a unique genomic print.[3] Similarly, the plasma of every individual has a different matrix composition. There are several biomolecules present in the plasma of an individual whose concentration varies not only from time to time but also from person to person. In addition, depending upon the medical, physical and emotional condition of the person the concentration of certain molecules may increase or decrease in the body thereby making the serum com-position even more varied. Thus, each human plasma being unique in nature would also have a different absorption at each wavelength. According to this logic, each person's absorption spectral scan would reveal a pattern unique to that individual at a given point of time.

Absorption spectral scan is a spectroscopic analysis wherein a serum sample is exposed to light rays of different wavelengths and the light emitted is recorded as a graph. Absorption spectral scan is relatively easy to perform with immediate results. It does not require any special reagents or skills to perform. The only requirements are a microtiter plate (ELISA plate) and an ELISA reader (spectro-photometer). A very small amount of sample volume is required for this test. The representative procedure is as follows: 50 µL sample is dispensed into the well of a microtiter plate and a spectral scan for absorbance ranging from 350 nm to 550 nm (with stepping up at 1nm) is programmed using a multi-mode reader (spectro-photometer). Following the read, a graph is generated.

A study done in our department has confirmed these observations and shown that each individual has a unique scan.[4] In this study the authors used absorption spectral scan to identify a preanalytical error (sample mix-up) in the clinical chemistry laboratory. The clinical chemistry laboratory receives patient samples in blood collection vials. These vials are centrifuged and serum is transferred to cuvettes which are placed in racks which are loaded into the autoanalyzer. Since this is a manual process, it is prone to preanalytical errors specially during labelling of samples. Suspecting such an error with two samples, the authors subjected the sample present in the vial and cuvette to an absorption spectral scan. This resulted in the production of two non-superimposable graphs between the sample present in the vial and cuvette. However, when the graphs of the suspected interchanged samples were compared, they were superimposable. The physical characteristics of the samples in the vial and cuvette also matched. This confirmed that there was an error while placing the cuvette onto the rack.

Applications of spectral scan may include forensic applications such as crosschecking of samples received for alcohol/drug testing when the chain of custody is questionable, or illicit practice is suspected, it can also be used in suspected cases of medicolegal sample mix-up. We have also done a similar study to assess the feasibility of absorption spectral scan in the screening of porphyria.[5] As the composition of plasma can vary over time depending on the environmental and emotional stress, studies need to be done to ascertain whether this pattern remains same or changes with time. Similarly, studies need to be done to ascertain the effect of growth on absorption spectral scan.

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