Ferritin Assay using Novel Dried Instant Plasma Spot Collection Technology

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Abstract

Background: The new dried instant plasma spot (DIPS) technology developed by our laboratory uses whole blood spotted on one end of a filter strip, so that the plasma and red cells rapidly separate before the blood has time to clot, leaving dried plasma at one end of the card and residual dried red cells at the other.

Methods: Blood samples were collected from 52 volunteers. Venous blood was drawn into serum separator tubes and non-additive tubes. DIPS were prepared immediately by spotting the blood from non-additive tubes on the collection cards and dried. Serum was separated by conventional methods and stored frozen until assayed. For the DIPS dried sample, two 6.0 mm punches from each card were dropped into a Nunc fritted deep 96 well plate (Figure 4). Phosphate Buffered Saline (100 µL) was added to each well containing the punched samples and the 96 well plate placed on a shaker at 700 rpm for 1 hour. The plate was centrifuged at 3000 rpm for 10 minutes to separate the filter paper from the supernatant, which was transferred to tubes for testing ferritin by the Siemens Immulite auto-analyzer. Ferritin results obtained from the DIPS were corrected for total protein to take into account differences in saturation of the filter paper.

Results: Results showed an excellent correlation between DIPS and serum for ferritin (R²=0.9), both analyzed by the Siemens Immulite Ferritin Assay.

Discussion

Radiology for testing analytes in serum or plasma (anti-coagulant treated), spotted and dried on filter paper, has been developed successfully by other laboratories. Dried spot collection methods (DSS and dried plasma spots) have been used for analyses of HIV-1 viral load5,6, as well as for detecting antibodies against a range of other blood-borne viral infections1-3,4,5,6.

Ferritin is a useful indicator of iron stores. The ultimate outcome of this research will be to make it possible to carry out large scale clinical studies that until now were either not possible or prohibitively expensive. The ultimate outcome of this research could be the widespread availability of DIPS technology to virtually any clinical laboratory using routine testing equipment.

Methods

We tested the feasibility of the use of the DIPS collection method for testing ferritin, which is not possible using DBS methodology. Blood samples from capillary (finger stick) and venous blood (venipuncture) were collected from 52 volunteers who are employees at ZRT Laboratory. Serum was prepared by conventional methods and stored frozen until assayed. For the DIPS dried sample, two 6.0 mm punches from each card were dropped into a Nunc fritted deep 96 well plate (Figure 4). Phosphate Buffered Saline (100 µL) was added to each well containing the punched samples and the 96 well plate placed on a shaker at 700 rpm for 1 hour. The plate was centrifuged at 3000 rpm for 10 minutes to separate the filter paper from the supernatant, which was transferred to tubes for testing ferritin by the Siemens Immulite auto-analyzer. Following ferritin testing the sample was transferred for total protein assay to a Siemens Dimension Xpand Plus where, it was analyzed for total protein content. Ferritin results obtained from the DIPS were corrected for total protein to take into account possible differences in saturation of the filter paper.

Dried Instant Plasma Collection

ZRT Laboratory, in collaboration with MDI Membrane Technologies, has developed a new technology that separates whole blood spotted on one end of a filter strip, so that the plasma and red cells rapidly separate before the blood has time to clot, leaving dried plasma at one end of the card and the residual dried red cells at the other. We have called this method of collection DIPS (Dried Instant Plasma Spots). The pictures on the left show the simplicity and convenience of sample collection (pictures 1, 2), blood separation (3), and testing (4) offered by DIPSS technology. It offers the convenience of point of care sample collection combined with the accuracy of testing by auto-analyzers.

Results

Data generated by this method showed an excellent correlation between DIPS and serum for ferritin (R²=0.9), both analyzed by the Siemens Immulite Ferritin Assay. We tested the feasibility of the use of the DIPS collection method for testing ferritin, which is not possible using DBS methodology. Blood samples from capillary (finger stick) and venous blood (venipuncture) were collected from 52 volunteers who are employees at ZRT Laboratory. Serum was prepared by conventional methods and stored frozen until assayed. For the DIPS dried sample, two 6.0 mm punches from each card were dropped into a Nunc fritted deep 96 well plate (Figure 4). Phosphate Buffered Saline (100 µL) was added to each well containing the punched samples and the 96 well plate placed on a shaker at 700 rpm for 1 hour. The plate was centrifuged at 3000 rpm for 10 minutes to separate the filter paper from the supernatant, which was transferred to tubes for testing ferritin by the Siemens Immulite auto-analyzer. Following ferritin testing the sample was transferred for total protein assay to a Siemens Dimension Xpand Plus where, it was analyzed for total protein content. Ferritin results obtained from the DIPS were corrected for total protein to take into account possible differences in saturation of the filter paper.

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