Gonadotropin and steroid hormone testing by conventional serum venipuncture and finger-stick dried blood spot

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Abstract

Objective: Blood spot testing is a less invasive and more convenient method than venipuncture for collecting blood samples for hormone testing and offers better ease and convenience to patients and healthcare providers. This simple method of blood collection also allows for a more viable means to carry out large-scale research and clinical studies on reproductive hormones. The present study shows that capillary finger-stick blood spot testing of gonadotrophins (LH and FSH) produces results comparable to conventional serum/plasma blood hormone levels. We have also observed similar results with blood spot testing of steroids (Data not included in this abstract).

Materials and Methods: Blood was collected by conventional venipuncture and by lancing the fingertip and collecting blood drops on a filter paper. Serum was analyzed for estradiol, progesterone, testosterone, LH and FSH by conventional commercial kits. Dried blood spots were rehydrated in buffer and analyzed by the same test kits, with modification.

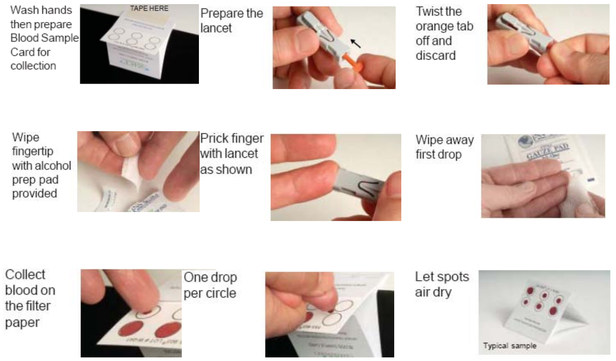
Results: Significant positive correlations were found between the blood spot and plasma samples of FSH (R2= 0.91) and LH (R2= 0.93). Although the gonadotropin levels obtained from blood spots (mean FSH 4.0 mIU/mL, LH 5.4 mIU/mL) were significantly different from those derived from plasma samples (mean FSH 4.5 mIU/mL, $p < 0.001$; LH 6.2 mIU/mL, $p < 0.001$) the magnitude of these differences (mean difference FSH 0.5 mIU/mL, LH 0.8 mIU/mL) is not clinically relevant.

Conclusion: Gonadotropin levels obtained from blood spot samples correlate well with values obtained from standard plasma assays. Based on these promising results, we are extending these studies to examine blood spot monitoring for ovarian hormones (estradiol and progesterone) and to track women through an entire menstrual cycle.

Background & Objective

Blood spot testing is a less invasive and more convenient method than venipuncture for collecting blood samples for hormone testing. Blood spot collection offers greater latitude regarding timing and convenience of collection for both the patient and the health care provider. This simple method of blood collection also allows for a more viable means to carry out large-scale research and clinical studies on reproductive hormones. The present study shows that capillary finger-stick blood spot testing of gonadotrophins (LH and FSH) produces results comparable to conventional serum/plasma blood hormone levels. We have also observed similar results with blood spot testing of steroids (Data not included in this abstract

Blood Collection Procedure



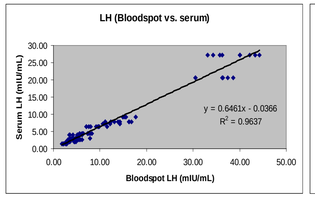
Methodology

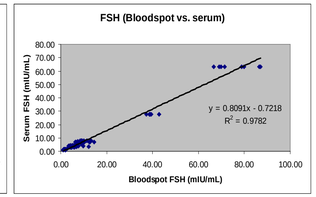
- ❖ Blood was collected by conventional venipuncture and by capillary finger-stick with the use of a lancet.
- ❖Whole blood collected by venipuncture was allowed to clot and serum prepared by centrifugation.
- ❖Blood spots were prepared by lancing the finger-tip and collecting blood drops on a filter paper.
- ❖Blood spots were allowed to dry for at least one hour and then stored at -20 C until assayed.
- ❖Serum was analyzed for estradiol, progesterone, testosterone, LH and FSH by conventional commercial kits.
- ❖Blood spots were analyzed by the same test kits, with modification. For blood spot testing, 6.4 mm discs were punched out from the filter paper and rehydrated in assay buffer containing detergent.
- ❖Standards and controls for blood spots were prepared by combining equal parts of washed red blood cells and charcoal-stripped human serum containing increasing steroid hormone concentrations (standard) or Biorad Lyphocheck controls.
- ❖LH and FSH standards were prepared by adding the serum standards directly to washed red blood cells

Observations

Significant positive correlations were found between the blood spot and plasma samples of FSH (R2= 0.91) and LH (R2= 0.93). Although the gonadotropin levels obtained from blood spots (mean FSH 4.0 mIU/mL, LH 5.4 mIU/mL) were significantly different from those derived from plasma samples (mean FSH 4.5 mIU/mL, $p < 0.001$; LH 6.2 mIU/mL, $p < 0.001$) the magnitude of these differences (mean difference FSH 0.5 mIU/mL, LH 0.8 mIU/mL) is not clinically relevant. Excluding imperfect blood spot samples (supersaturated, not sufficient quantity) did not greatly improve correlation

Correlations





Conclusion

Gonadotropin levels obtained from blood spot samples correlate well with values obtained from standard plasma assays. Based on these promising results, we are extending these studies to examine blood spot monitoring for ovarian hormones (estradiol and progesterone) and to track women through an entire menstrual cycle.

References

- ❖Worthman CF and Stallings JF. Hormone measures in finger-prick blood spot samples: new field methods for reproductive endocrinology. Am J Phys Anthropol. 1997 Sep;104(1):1-21
- ❖Worthman CF and Stallings JF. Measurement of gonadotropins in dried blood spots. Clin Chem. 1994 Mar;40(3):448-53.