Blood Spot Test Specifications

Cortisol

Clinical Information

Under the direction of the hypothalamus and pituitary, and controlled by a negative feedback loop, the zona fasiculata of the adrenal cortex is stimulated by adrenocorticotrophic hormone to produce cortisol in response to stressors. The feedback loop is commonly referred to as the hypothalamic-pituitary-adrenal (HPA) axis. Cortisol production is normally at its highest upon waking and declines steadily during the day, reaching its lowest point at bedtime. Cortisol has a wide range of effects on mind and body and interacts with the reproductive, thyroid and immunological systems. As part of the stress response, it prepares the body for "fight or flight" and in doing so it can suppress the production of other hormones, including those involved with reproduction, and some immune functions. When cortisol levels remain high as a result of chronic exposure to stressors, this suppression of other systems is maintained for longer than normal and can result in susceptibility to infection, hypothyroidism, bone loss, infertility, and low libido. On the other hand, lower than normal cortisol levels can result from adrenal insufficiency or "burnout", and are associated with decreasing attention span, fatigue, allergies, and blood sugar imbalances. Since both high and low cortisol levels are associated with multiple symptoms, cortisol testing can help identify the causes of complicated health issues. The reference range for blood spot cortisol levels is 8.5—19.8 µg/dL (morning) and 3.3—8.5 µg/dL (evening/night).

References:

Worthman CM, Stallings JF. Hormone measures in finger-prick blood spot samples: new field methods for reproductive endocrinology. Am J Phys Anthropol.1997;104:1-21.

Wong V, Yan T, Donald A, McLean M. Saliva and bloodspot cortisol: novel sampling methods to assess hydrocortisone replacement therapy in hypoadrenal patients. Clin Endocrinol (Oxf) 2004;61:131-7.

Chida Y, Steptoe A. Cortisol awakening response and psychosocial factors: a systematic review and meta-analysis. Biol Psychol. 2009;80:265-78.

Meewisse ML, Reitsma JB, de Vries GJ, et al. Cortisol and post-traumatic stress disorder in adults: systematic review and meta-analysis. Br J Psychiatry 2007;191:387-92.

Assay Method: EIA

Intra-assay Precision

Intra-assay precision was determined by choosing three samples spanning the reference range, and analyzing them multiple times within the same run. Results are shown below:

Mean Cortisol Concentration (µg/dL)	Standard Deviation	Coefficient of Variation (C.V. %)
3.2	0.4	12.8
5.3	0.5	9.4
16.1	1.7	10.8

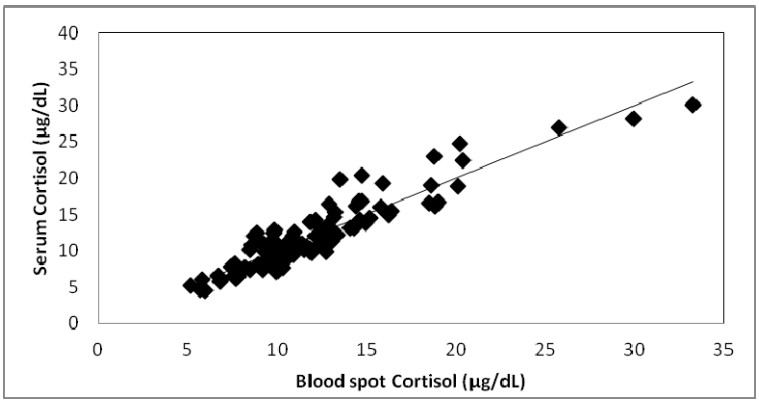
Inter-assay Precision

Inter-assay precision was determined by choosing three samples spanning the reference range, and analyzing them multiple times throughout different runs. Results are shown below:

Mean Cortisol Concentration (µg/dL)	Standard Deviation	Coefficient of Variation (C.V. %)
2.9	0.6	19.2
9.5	1.3	13.1
17.9	2.8	15.6

Accuracy

To test the accuracy of the dried blood spot assay for cortisol, dried blood spot samples collected at the same time as corresponding serum samples were analyzed by linear regression. Resulting correlation data are shown below (R = 0.93):



Analyte Stability

The dried blood samples are stable for more 1 month at room temperature.

Specimen Collection

Kits for blood spot collection contain a filter paper collection card, finger lancets, an alcohol prep pad, sterile gauze, a band-aid, easy-to-follow instructions, and a mailer to return the sample for analysis.