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**Cortisol Levels**  
Hair Analysis Report

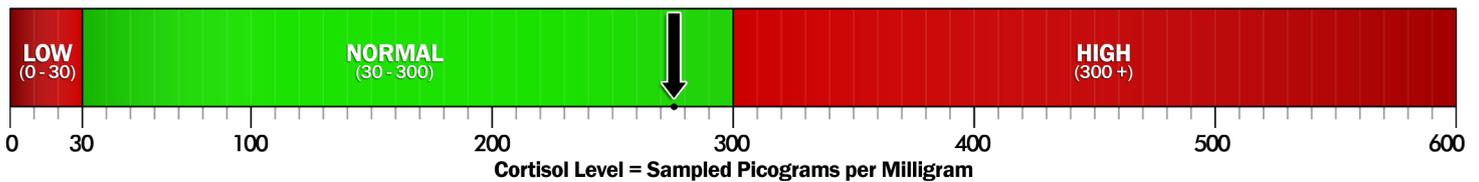
**Sample ID:** HCA1347  
**Analysis Date:** 8/16/2019

Your cortisol report is a measurement of the picograms of cortisol per milligram as analyzed in the hair sample provided.

The results presented in this report are applied to a scale determined by CanAlt research and several publications. Scales of cortisol concentrations are dependent on the analytical procedures used in the laboratory. Variations in distribution may occur based on processes performed in the laboratory like washing the hair prior to extraction. These processes may not be part of all laboratory procedures as there is no regulatory procedure.

**Your Cortisol Measurement:**  
**276**  
(pg per mg)

**Your Cortisol Level: Normal**



Ranges and risk assessments shown are based off numerous published studies and ongoing in-house research.

Cortisol is released by the adrenal gland following the stimulation by ACTH (adrenocorticotropic hormone) which is produced by the anterior pituitary gland. This gland is itself triggered by corticotropin-releasing hormone produced by the hypothalamus. This process is called hypothalamus-pituitary-adrenal (HPA) axis.

Measurement of cortisol can be done in saliva, blood and urine. These matrices reflect current levels in the body. Long term levels as measured in hair may allow assessments relating to causation of chronic diseases based on a continuous activation of the HPA axis.

Research has shown a positive relationship between hair cortisol and the severity of chronic heart failure.<sup>1</sup>

Very low cortisol in the body is caused by an adrenal crisis known as Addison's disease. Symptoms of this disease are:

- Fatigue
- Nausea
- Chronic constipation or diarrhea
- Hyperpigmentation
- Stress intolerance

On the other hand, overproduction of Cortisol is called Cushing's disease<sup>12</sup> with the following being some of the symptoms:

- Fat deposits on back of neck and abdomen
- Fluid retention
- GI issues - acidic
- Hyperglycemic
- Red round face

Hair analysis for cortisol is seen as a new tool for the diagnosis of these diseases.<sup>2</sup> Hair cortisol measurements have been validated by repeated measurements of saliva and urine.<sup>3</sup> Hair cortisol has also been linked to chronic stress and mental health disorders.<sup>4</sup>

Levels are also elevated during pregnancy<sup>5</sup> by two-fold compared to normal women. In this study the age of the women, hair curvature, hair colour and frequency of hair washes per week were unrelated to cortisol levels.

The hair matrix allows the measurement of free cortisol<sup>6</sup> for periods up to six months. Beyond this time the cortisol levels are lower due to the amount of washing the hair has been submitted to.

General observations relating to cortisol levels in hair<sup>9</sup> the Whitehall II Study:

1. In general women have lower levels than men
2. Higher levels seen with diabetes
3. Higher in blacks than other ethnic groups - possibly because of hair being coarser seems to increase cortisol levels (in-house study)
4. Depressive symptoms were associated with elevated levels although prolonged depression like PTSD showed lower levels
5. Age did not show differences in levels when corrected for diseases
6. Taking corticosteroids generated lower hair levels of cortisol
7. High BMI individuals had higher cortisol levels<sup>9</sup>
8. Dyed hair had lower cortisol levels
9. Lower cortisol levels seen in seasons other than winter

There have been many studies on items that cause cortisol levels to be elevated. The following are a few that are referenced in Wikipedia.

Viral infections, caffeine, sleep deprivation, aerobic exercise, severe trauma, stressful events, subcutaneous adipose tissue (high BMI), and anorexia nervosa.

A study on chronic pain individuals<sup>11</sup> having opioid treatment also showed elevated hair cortisol.

Other possible effects of high cortisol may be hair loss.<sup>7</sup> Some "Hair loss" has been associated with stress which in turn produces elevated Cortisol. There is also strong evidence from animal studies<sup>8</sup> that psychoemotional stress induced abnormal hair growth cycle and the use of free radical scavenger (Tempol) restored the hair growth cycle. This points to the negative role of Reactive Oxygen Species (ROS) that may produce free radicals.

**Note:** The assay for cortisol is performed using antibodies for cortisol following the hair extraction. As with any antibody cross-reactivity may occur. The principal cross-reactivity with the assay antibody is Prednisolone/Prednisone. The cortisol readings may be elevated if the patient is taking these steroids.

## References:

- <sup>1</sup> D Pereg et al. J Psychoneuroendocrinology, V38,2875,2013. E Lob and A Steptoe, Curr Cardio Rep., V21, 116 2019
- <sup>2</sup> I. Manenschijn et al., Endocrine Abstracts, 11, V29, 2012
- <sup>3</sup> E Russell et al., J Psychoneuroendocrinology, V37, 589, 2012, and Gow et al., Forensic Sci International,196, 32 2010
- <sup>4</sup> I Manenschijn, et al., J Psychoneuroendocrinology, V37, 1960,2012, A V Herane J Psychiatr Res V70,38,2015
- <sup>5</sup> Kirshbaum et al., J Psychoneuroendocrinology 34,32,2009
- <sup>6</sup> Dettenborn et al,J Psychoneuroendocrinology V9,1404, 2010
- <sup>7</sup> E Thom, J Drugs Dermatol 1001-04,15(8),2016
- <sup>8</sup> N Liu et al., PLoS One, 8,2013
- <sup>9</sup> J G Abell et al., J Psychoneuroendocrinology 73,148,2016
- <sup>10</sup> T Stadler et al., Biological Psychology, 90, 218, 2012
- <sup>11</sup> S H M Van Uum et al., Stress V11, 483, 2008
- <sup>12</sup> H Nishioka, S Yamada, J Clin Med. V 8(11): 1951, 2019

## Hair Cortisol Analysis

- These results only relate to the sample as received.

This report is not intended as a medical report or advice to individuals from CanAlt Health Laboratories, it is solely a measurement and calculation of cortisol based on the sample(s) provided. "Risk Levels" are intended as a quick reference of these measurements as compared to current research, but should be interpreted by a licensed medical professional for advice on any lifestyle changes and/or supplementation that may be required.

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