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**Collection Date:** 20-Jan-2014  
**Collection Time(s):** 7:15 am  
 12:30 pm  
 8:00 pm  
 10:00 pm  
**Sample Received:** 21-Jan-2014  
**Reported On:** 28-Jan-2014

**Saliva Hormone Test**

**Accession Number : 400000**

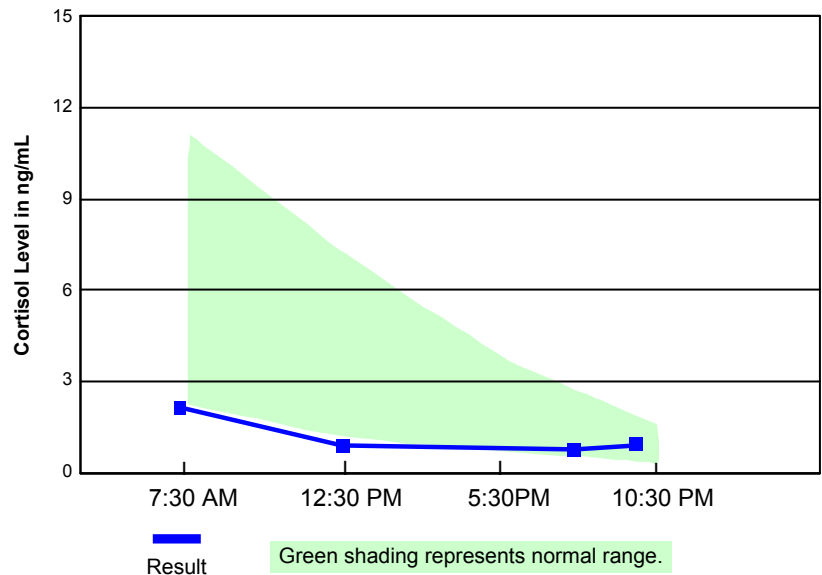
**Provider:**

**Client:**  
 John Doe

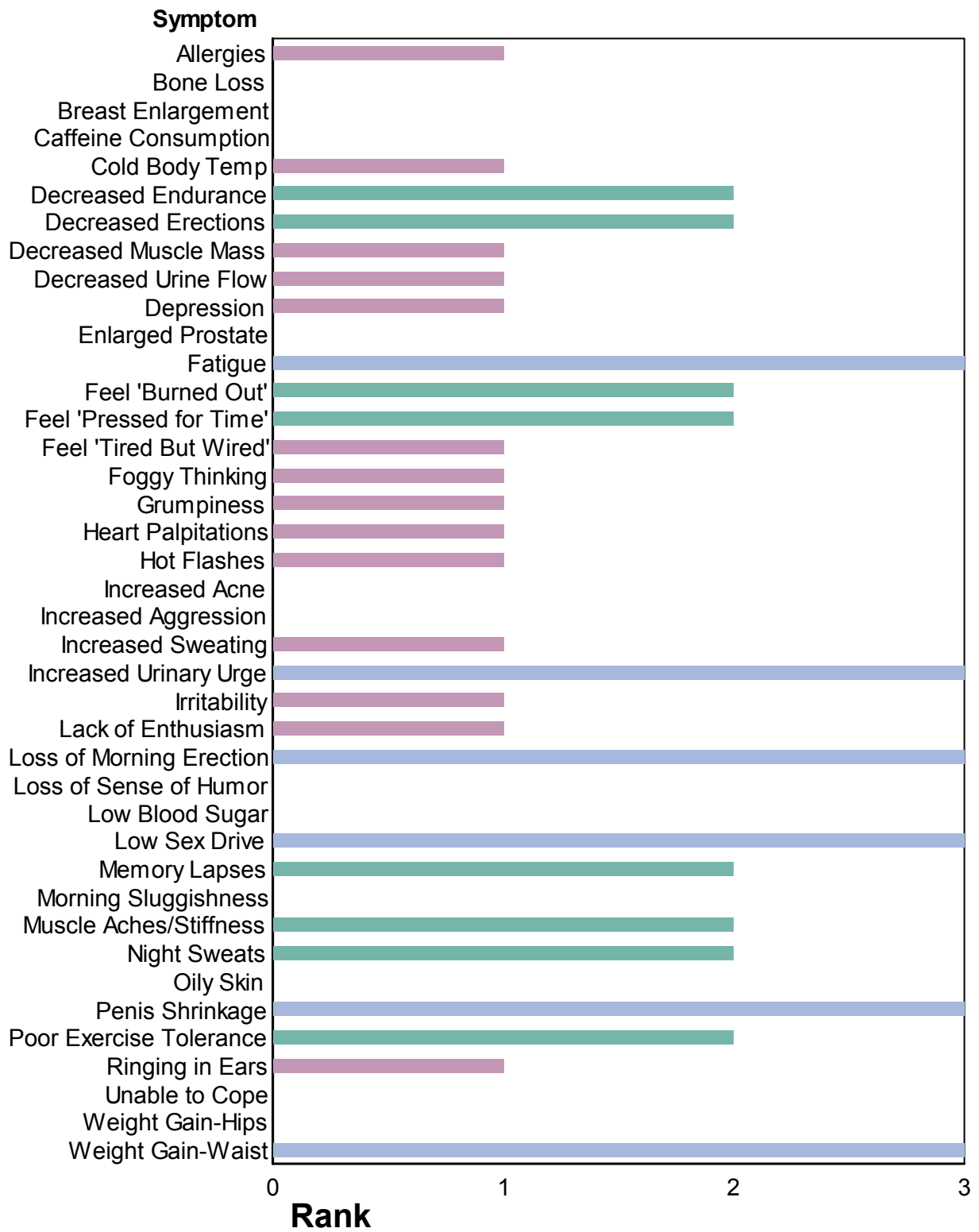
**Age:** 57  
**DOB:**  
**Gender:** M

Hormone	Status	Result	Range	Units	Range Applied
Estradiol	High end of range	4.0	0.80 - 6.6	pg/mL	Male endogenous range
Testosterone	Low end of range	47	23 - 120	pg/mL	Endogenous testosterone > 50 yrs
DHEAS	Within range	3.5	1.5 - 8.0	ng/mL	Male DHEAS 55-64 years
Cortisol AM	Low end of range	2.1	2.0 - 11	ng/mL	Sampled within 1 hour of waking
Cortisol Noon	Below range	0.88	1.0 - 7.0	ng/mL	Sampled at noon
Cortisol PM	Within range	0.75	0.20 - 2.2	ng/mL	Sampled between 7 and 9 PM
Cortisol HS	Within range	0.91	0.20 - 1.3	ng/mL	Sampled after 9 PM and before 1 AM

**Adrenal Function Graph**



*George Gillson*  
 George Gillson MD, PhD  
 Medical Director



\* Indicates symptom left blank.

#### DHEAS RANGE CHANGE

The ranges for DHEAS have been changed effective November 20, 2013. This was necessitated by adoption of new assay methodology which will allow for improved turnaround time. We apologize for any inconvenience this may cause.

This patient's BMI is 33. Patients with a Body Mass Index (BMI) between 25 and 30 are defined as overweight and obesity is defined as BMI greater than 30. Although elevated BMI is associated with increased risk of metabolic syndrome and insulin resistance, not all patients with high BMI have metabolic abnormalities. For example, a well-muscled individual may have a BMI in excess of 30, yet still be metabolically normal. Increased waist circumference is a better predictor of these health risks, and in males, a waist circumference equal to or greater than 40 inches is worrisome. Furthermore, in males, increased waist circumference coupled with clinical signs and/or symptoms of androgen deficiency places an individual at significantly increased risk of cardiovascular disease and diabetes. Weight reduction and reduced consumption of refined carbohydrates and comprehensive nutritional intervention are worthwhile approaches for patients with elevated BMI/increased waist circumference/clinical androgen deficiency.

Estradiol is high normal or high. Symptoms of elevated estrogens may include low testosterone symptoms, breast enlargement, prostate complaints and vasomotor symptoms. Factors affecting estradiol levels include percent body fat and excessive consumption of commercially raised beef and poultry (which can be high in estrone/estrone sulphate). High estradiol may reflect sluggish clearance of estrogens by the liver. Oral supplementation with DHEA has been shown to elevate estradiol levels in males. The same is probably also true of pregnenolone. Estradiol may also be elevated due to skin to skin contact with another individual who is using topical or intravaginal estradiol.

Estradiol may also be elevated due to aromatization of testosterone. If an individual has high endogenous testosterone, estradiol may also be high due to a normal amount of aromatase activity. In this case, a proper ratio T/E2 would be preserved. (Here the ratio T/E2 is 12 and a normal ratio is above 20.) In other cases, estradiol is high in the face of a normal amount of testosterone due to excessive aromatase activity, and zinc deficiency may play a role in this. (A normal amount of zinc governs the transcription of the gene for synthesis of the aromatase enzyme; too little zinc can lead to excess production of aromatase.)

A 2006 study looked at the utility of salivary testosterone for the diagnosis of hypogonadism in 127 males, in comparison to standard serum assays, and concluded that salivary testosterone is on par with serum assays in this regard. (Morley JE et al. Validation of salivary testosterone as a screening test for male hypogonadism. *Aging Male* 2006;9:165-169) The authors noted the following: "... salivary testosterone was strongly correlated with bioavailable testosterone ( $p < 0.00001$ ) calculated free testosterone ( $p < 0.00001$ ) and total testosterone ( $p < 0.002$ ). Salivary testosterone was significantly related to hypogonadal symptoms on the St. Louis University ADAM questionnaire and the Aging Male Survey. These studies support the use of salivary testosterone as an acceptable assay for screening for hypogonadism."

Tinnitus (ringing in the ears) is sometimes associated with zinc deficiency. (Yetiser et al. The role of zinc in management of tinnitus. *Auris Nasus Larynx* 2002 Oct;29:329-33.) Zinc, in turn, is an important trace element for maintaining normal testosterone levels. For example, the conformation of the testosterone/estradiol binding site on SHBG is zinc dependent. Zinc is also important for blocking the conversion of testosterone to estradiol. Growth hormone is stored in the pituitary as a dimer complexed to zinc, and zinc deficiency is associated with lowered hepatic IGF production in response to growth hormone.

The patient indicates that decreased erections and/or loss of morning erection are of concern. Note that problems with erectile function can be a side effect of medication, or may be indicative of vascular disease. These complaints are not automatically accompanied by low testosterone.

Testosterone is low/low normal and there are symptoms of low testosterone. Symptoms can include fatigue,

decreased sex drive, diminished quality of erections, deterioration in athletic performance, strength and endurance, loss of self esteem, depression, irritability, loss of motivation and overall decreased enjoyment of life. (Tremblay R, Morales A. Canadian practice recommendations for screening, monitoring and treating men affected by andropause or partial androgen deficiency. *The Aging Male* 1998;1:213-218.) The best course of action in this case will have to be decided by the treating physician.\*

A survey of males (20 to 54 years old) with TSH <10 indicated that they had normal serum estradiol in the face of low serum testosterone. This is possibly consistent with increased aromatase activity in the face of suboptimal thyroid parameters. (Hypoandrogenaemia is associated with subclinical hypothyroidism in men. Kumar A, Chaturvedi PK, Mohanty BP. *Int J Androl* 2007;30:14-20.) A finding of low testosterone in conjunction with signs and symptoms of hypothyroidism might prompt an investigation of thyroid function.

In a February 2004, in-house survey of 20 males less than 35 years of age, 95% of the T/E2 ratios fell between 20 and 40. Here the ratio is less than 20, and the testosterone level is low normal or low. So there are two problems: low testosterone, and too much estradiol relative to whatever testosterone is present (relative excess of estradiol). Symptoms of low testosterone include fatigue, decreased sex drive, diminished quality of erections, deterioration in athletic performance, strength and endurance. Other symptoms include loss of self esteem, depression, irritability, loss of motivation and overall decreased enjoyment of life. (Tremblay R, Morales A. Canadian practice recommendations for screening, monitoring and treating men affected by andropause or partial androgen deficiency. *The Aging Male* 1998;1:213-218.) A relative excess of estradiol may be associated with increased risk of prostate disease, and may also be associated with elevated cortisol, since cortisol promotes the expression of aromatase, the enzyme which converts testosterone to estradiol. This conversion takes place in adipose tissue, therefore a low T/E2 ratio may also be associated with obesity/increased waist-hip ratio. A relative excess of estradiol may also be seen in the context of zinc deficiency, excessive consumption of commercially-raised beef and poultry, as well as excessive alcohol intake. Some supplements such as DHEA, growth hormone and boron as well as growth hormone releasing agents may elevate estradiol. The treating physician is best suited to determine the appropriate course of action.\*

RMA database analysis (February 2008) indicates that a low first morning cortisol result has fairly good ability to predict cortisol levels throughout the rest of the day, and correlates fairly well to certain symptoms. If morning cortisol is low, this tends to be "as good as it gets"; subsequent levels may often (but not always!) also be low. Symptoms which correlate reasonably well to low morning cortisol include anxiety, increased tendency to allergies, morning sluggishness, feeling tired but wired, headaches, irritability, muscle aches and problems with memory. These symptoms will not necessarily all be present in every individual with low morning cortisol. Note that some individuals using inhaled or topical glucocorticoids can exhibit low morning cortisol and these people are often asymptomatic.

There is some evidence of an association between low cortisol and chronic pain syndromes including pelvic pain and functional gastrointestinal pain. (Ehler U, Nater U, Bohmelt A. *J Psychosomatic Res* 2005;59:7-10.)

There is also some indication that poor sleep is associated with lower morning cortisol. More specifically, individuals who experience frequent nightly awakening, have poor self-rated quality of sleep and a subjective impression of poor recovery after awakening have lower morning cortisol levels compared to those who sleep soundly and wake refreshed. Backhaus JB, Junghanns K, Hohagen F. Sleep disturbances are correlated with decreased morning awakening salivary cortisol. *Psychoneuroendocrinology* 2004;29:1184-1191.

Here, at least two of the cortisol points are low normal or below normal and there are symptoms consistent with a degree of adrenal axis dysfunction. Fatigue (especially morning fatigue), anxiety, difficulty maintaining energy throughout the day, feeling flat or "burned out", excessive use of caffeine, hypoglycemic episodes, depression, allergies, and decreased exercise tolerance are some of the symptoms which can be indicative of adrenal dysregulation/adrenal fatigue, although not all these symptoms will be present in every individual. Low or low normal cortisol output may impair the action of thyroid hormone, and lead to functional hypothyroidism (symptoms of low thyroid such as feeling cold, depression, dry skin, constipation and weight gain, with normal thyroid tests). "Adrenal Fatigue: The 21st Century Stress Syndrome" by James Wilson DC ND PhD is an

excellent reference on this topic. Ultimately, the treating physician is best able to determine the appropriate course of action.\*



George Gillson MD, PhD  
Medical Director

Note: The College of Physicians and Surgeons of Alberta considers saliva hormone testing and some forms of bio-identical hormone replacement to be complementary medicine. The interpretation comments have not been evaluated or approved by any regulatory body. Commentary is provided to clinicians for educational purposes and should not be interpreted as diagnostic or treatment recommendations. \*General treatment suggestions can be found in the Rocky Mountain Analytical Resource Binder.