Accession # 00278773
Jessica Ehrlich
25 Abbotts Rd
, QLD

Last Menstrual Period:

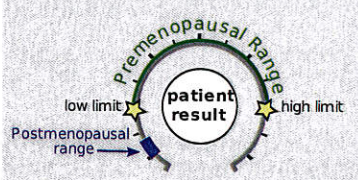
Ordering Physician:
Research Nutrition

DOB: 1984-04-11
Age: 33
Gender: Female

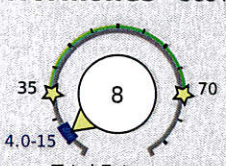
Collection Times:
2017-10-24 11:58PM
2017-10-25 06:01AM
2017-10-25 08:01AM
2017-10-24 05:01PM
2017-10-24 10:01PM

Hormone Testing Summary

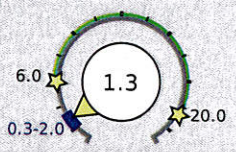
Key (how to read the results):



Sex Hormones
See Pages 2 and 3 for a thorough breakdown of sex hormone metabolites

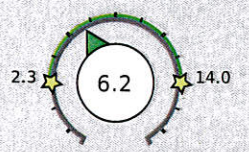


Total Estrogen
(Sum of 8 Estrogen Metabolites)



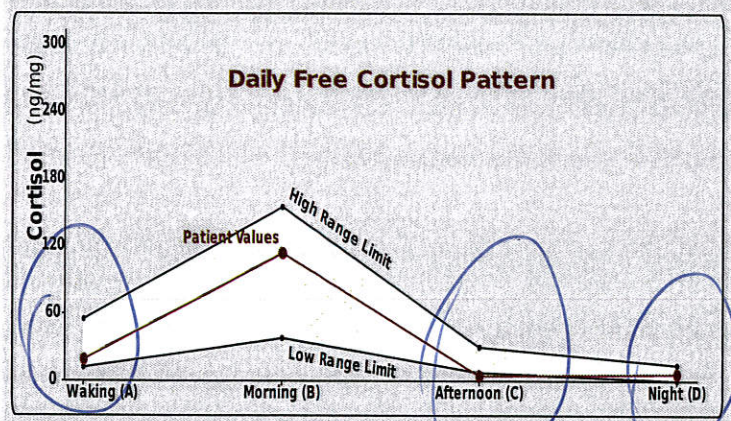
Progesterone
(Serum Equivalent, ng/mL)

Progesterone Serum Equivalent is a calculated value based on urine pregnanediol.



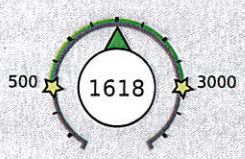
Testosterone

Adrenal Hormones
See pages 4 and 5 for a more complete breakdown of adrenal hormones

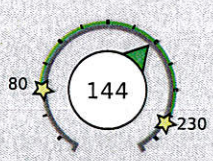


Total DHEA Production

Age	Range
20-39	1300-3000
40-60	750-2000
>60	500-1200

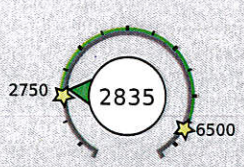


Total DHEA Production
(DHEAS + Etiocholanolone + Androsterone)



24hr Free Cortisol
(A+B+C+D)

cortisol metabolism



Metabolized Cortisol (THF+THE)
(Total Cortisol Production)

Free cortisol best reflects tissue levels. Metabolized cortisol best reflects total cortisol production.

Please be sure to always read below for any specific lab comments. More detailed comments can be found on page 8.

- Because inflammation blocks DHEA being converted to DHEAS, consider inflammation as a potential part of the overall clinical picture when DHEAS is significantly lower than the downstream metabolites of DHEA (Androsterone, Etiocholanolone) as seen in this case (see page3).
- The patient shows significantly higher free cortisol compared to metabolized cortisol. It may be advisable to check thyroid hormones if you have not. See comments in the notes for more details.

==========

Your DUTCH Complete report will include a summary (page 1), a list of all of the hormones tested and their ranges (pages 2,4,6) as well as a graphical representation of the results (pages 3,5). You will also see a steroid pathway for your reference (page 7) and provider notes.
This report is not intended to treat, cure or diagnose any specific diseases.
There is a series of videos in our video library at dutchtest.com that you may find useful in understanding the report. The following videos (which can also be found on the website under the listed names) may be particularly helpful in aiding your understanding:
DUTCH Complete Overview (quick overview)
The reports have been updated (11.15.2017) and this Update Video will assist you with those updates.

dutchtest
BY PRECISION ANALYTICAL INC.

Accession # 00278773
Jessica Ehrlich
25 Abbotts Rd
, QLD

PRECISION ANALYTICAL INC.
SIMPLY · BETTER · TESTING

Sex Hormones and Metabolites

Ordering Physician:
Research Nutrition

DOB: 1984-04-11
Age: 33
Gender: Female

Last Menstrual Period:

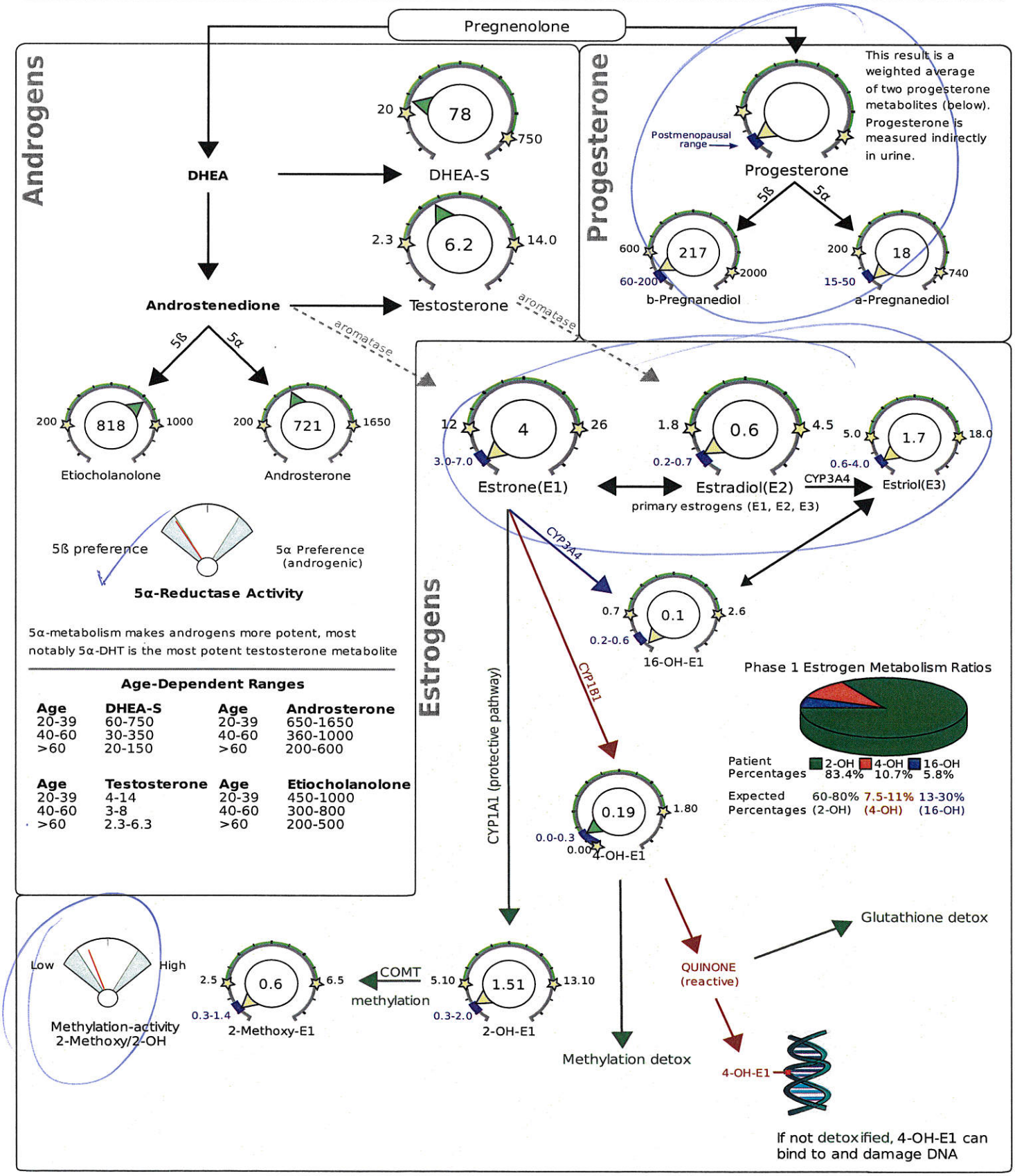
Collection Times:
2017-10-24 11:58PM
2017-10-25 06:01AM
2017-10-25 08:01AM
2017-10-24 05:01PM
2017-10-24 10:01PM

Test		Result	Units	Luteal Range	Postmenopausal Range
Progesterone Metabolites (Urine)					
b-Pregnanediol	Below luteal range	217.0	ng/mg	600 - 2000	60-200
a-Pregnanediol	Below luteal range	18.0	ng/mg	200 - 740	15-50
Estrogen Metabolites (Urine)					
Estrone(E1)	Below luteal range	3.5	ng/mg	12 - 26	3.0-7.0
Estradiol(E2)	Below luteal range	0.6	ng/mg	1.8 - 4.5	0.2-0.7
Estriol(E3)	Below luteal range	1.7	ng/mg	5 - 18	0.6-4.0
2-OH-E1	Below luteal range	1.51	ng/mg	5.1 - 13.1	0.3-2.0
4-OH-E1	Within luteal range	0.19	ng/mg	0 - 1.8	0-0.3
16-OH-E1	Below luteal range	0.1	ng/mg	0.7 - 2.6	0.2-0.6
2-Methoxy-E1	Below luteal range	0.6	ng/mg	2.5 - 6.5	0.3-1.4
2-OH-E2	Low end of luteal range	0.18	ng/mg	0 - 1.2	0-0.3
Androgen Metabolites (Urine)					
DHEA-S	Low end of range	78.0	ng/mg	20 - 750	
Androsterone	Within range	721.0	ng/mg	200 - 1650	
Etiocholanolone	Within range	818.0	ng/mg	200 - 1000	
Testosterone	Within range	6.2	ng/mg	2.3 - 14	
5a-DHT	Within range	1.9	ng/mg	0 - 6.6	
5a-Androstanediol	Within range	21.7	ng/mg	12 - 30	
5b-Androstanediol	Above range	79.7	ng/mg	20 - 75	
Epi-Testosterone	Below range	1.7	ng/mg	2.3 - 14	

This test is intended to be taken in the luteal phase of the menstrual cycle (days 19-22 of a 28 day cycle) for premenopausal women. The ranges in the table below may be used when samples are taken during the first few days (follicular) of the cycle, during ovulation (days 11-14) or when patients are on oral progesterone. See the following pages for age-dependent ranges for androgen metabolites.

Additional Normal Ranges	Follicular	Ovulatory	Oral Pg (100mg)
b-Pregnanediol	100-300	100-300	2000-9000
a-Pregnanediol	25-100	25-100	580-3000
Estrone (E1)	4.0-12.0	22-68	N/A
Estradiol (E2)	1.0-2.0	4.0-12.0	N/A

Hormone metabolite results from the previous page are presented here as they are found in the steroid cascade. See the Provider Comments for more information on how to read the results.



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BY PRECISION ANALYTICAL INC.

Accession # 00278773
Jessica Ehrlich
25 Abbotts Rd
, QLD

PRECISION ANALYTICAL INC.
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Advanced Adrenal Assessment

Last Menstrual Period:

Ordering Physician:
Research Nutrition

DOB: 1984-04-11
Age: 33
Gender: Female

Collection Times:
2017-10-24 11:58PM
2017-10-25 06:01AM
2017-10-25 08:01AM
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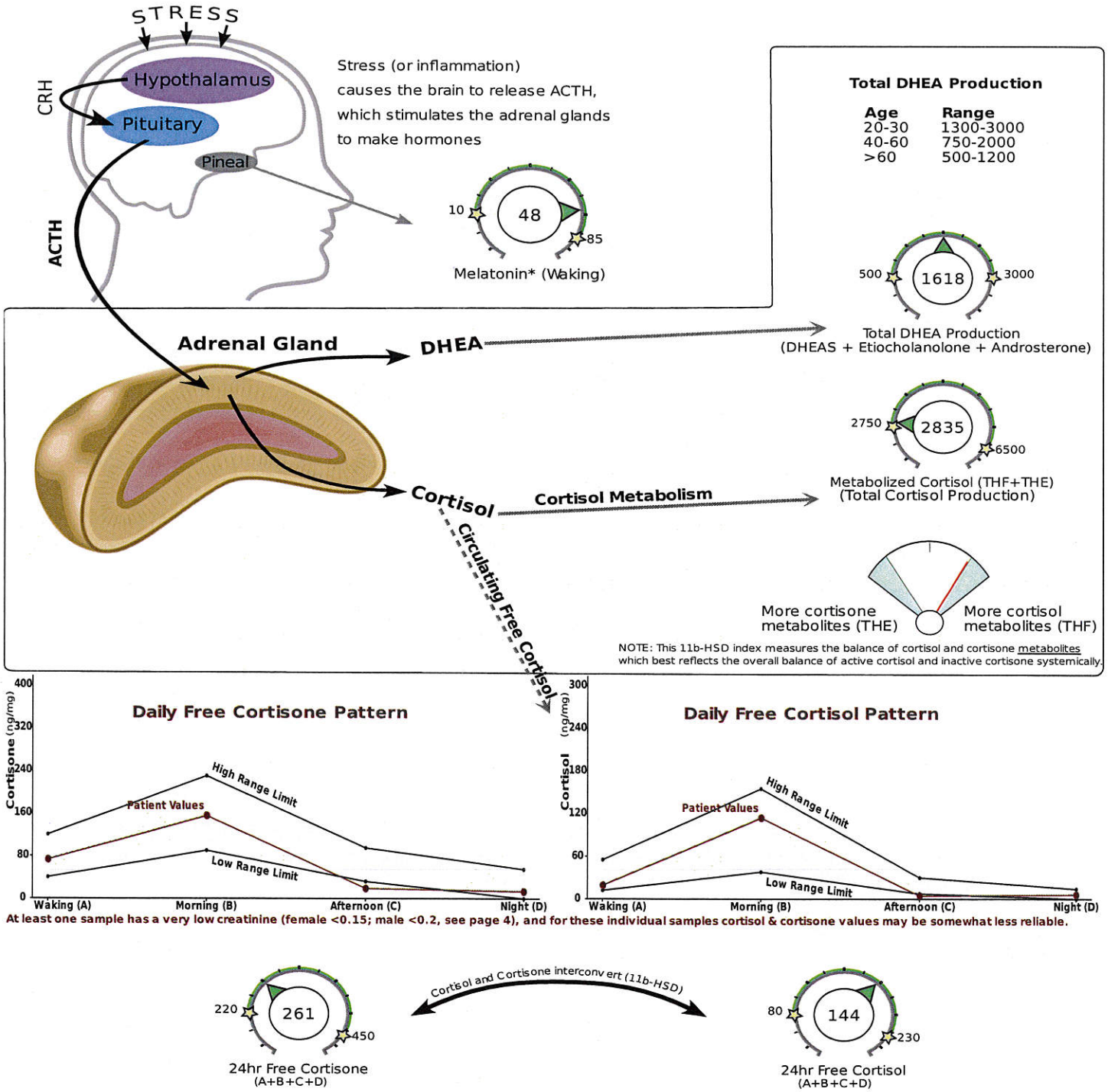
2017-10-24 10:01PM

Category	Test		Result	Units	Normal Range
Creatinine (Urine)					
	Creatinine A (Waking)	Within range	0.71	mg/ml	0.2 - 2
	Creatinine B (Morning)	Below range	0.18	mg/ml	0.2 - 2
	Creatinine C (Afternoon)	Below range	0.12	mg/ml	0.2 - 2
	Creatinine D (Night)	Below range	0.06	mg/ml	0.2 - 2
Daily Free Cortisol and Cortisone (Urine)					
	Cortisol A (Waking)	Low end of range	19.2	ng/mg	12 - 55
	Cortisol B (Morning)	Within range	113.9	ng/mg	38 - 155
	Cortisol C (Afternoon)	Below range	4.5	ng/mg	7.3 - 30
	Cortisol D (Night)	Within range	6.1	ng/mg	0 - 14
	Cortisone A (Waking)	Within range	73.2	ng/mg	40 - 120
	Cortisone B (Morning)	Within range	155.1	ng/mg	90 - 230
	Cortisone C (Afternoon)	Below range	19.1	ng/mg	32 - 95
	Cortisone D (Night)	Within range	13.5	ng/mg	0 - 55
	24hr Free Cortisol	Within range	144.0	ng/mg	80 - 230
	24hr Free Cortisone	Low end of range	261.0	ng/mg	220 - 450
Cortisol Metabolites and DHEA-S (Urine)					
	a-Tetrahydrocortisol (a-THF)	Low end of range	133.0	ng/mg	75 - 370
	b-Tetrahydrocortisol (b-THF)	Low end of range	1273.0	ng/mg	1050 - 2500
	b-Tetrahydrocortisone (b-THE)	Below range	1429.0	ng/mg	1550 - 3800
	Metabolized Cortisol (THF+THE)	Low end of range	2835.0	ng/mg	2750 - 6500
	DHEA-S	Low end of range	78.0	ng/mg	20 - 750



At least one sample has a very low creatinine (female <0.15; male <0.2, see page 4), and for these individual samples cortisol & cortisone values may be somewhat less reliable.

The first value reported (Waking "A") for cortisol is intended to represent the "overnight" period. When patients sleep through the night, they collect just one sample. In this case, the patient woke during the night and collected (see the top of the report for the times collected). We call this value "A1" and the value from the sample collected at waking "A2." These values are used to create a "time-weighted average" to create the "A" value. The individual values are listed here for your use:
The middle-of-the-night "A1" sample registered a cortisol value of 14ng/mg.
The waking "A2" sample registered a cortisol value of 21ng/mg.
These two values are averaged together, taking into account the amount of time each one represents, to create the "A" value of approximately 19ng/mg that you will see on the report.

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DUTCH Extras

Category	Test		Result	Units	Normal Range
Melatonin (*measured as 6-OH-Melatonin-Sulfate) - (Urine)					
	Melatonin* (Waking)	Within range	48.1	ng/mg	10 - 85
Oxidative Stress / DNA Damage, measured as 8-Hydroxy-2-deoxyguanosine (8-OHdG) - (Urine)					
	8-OHdG (Waking)	Within range	3.2	ng/mg	0 - 5.2

Steroid Pathways

Find these Hormones on the DUTCH Complete

Primary hormones (in CAPS) are made by organs by taking up cholesterol ★ and converting it locally to, for example, progesterone. Much less is made from circulating precursors like pregnenolone. For example, taking DHEA can create testosterone and estrogen, but far less than is made by the testes or ovaries, respectively.

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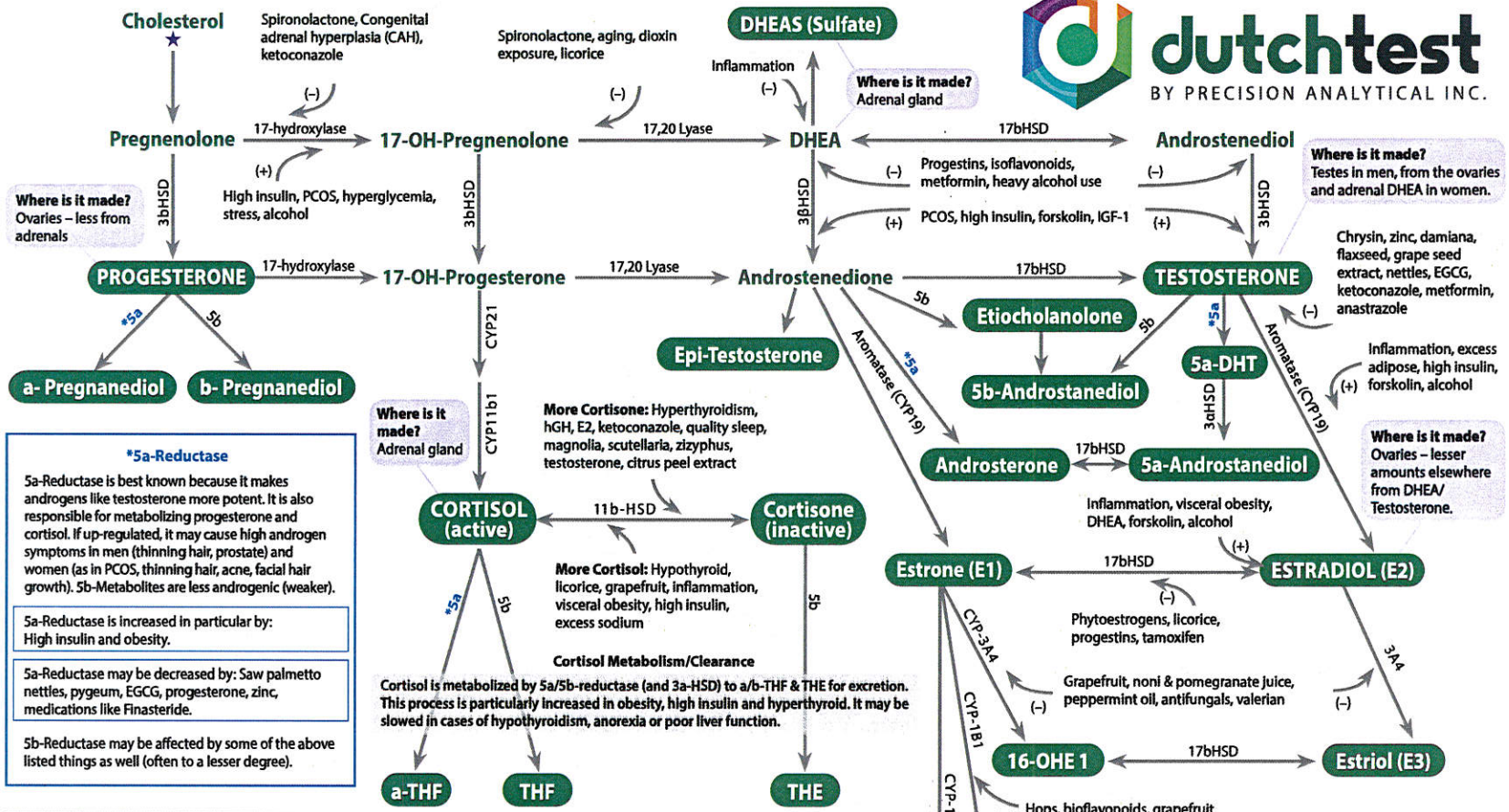


Cortisol Metabolism/Clearance

Cortisol is metabolized by 5a/5b-reductase (and 3a-HSD) to a/b-THF & THE for excretion. This process is particularly increased in obesity, high insulin and hyperthyroid. It may be slowed in cases of hypothyroidism, anorexia or poor liver function.

*5a-Reductase

5a-Reductase is best known because it makes androgens like testosterone more potent. It is also responsible for metabolizing progesterone and cortisol. If up-regulated, it may cause high androgen symptoms in men (thinning hair, prostate) and women (as in PCOS, thinning hair, acne, facial hair growth). 5b-Metabolites are less androgenic (weaker).

5a-Reductase is increased in particular by: High insulin and obesity.

5a-Reductase may be decreased by: Saw palmetto nettles, pygeum, EGCG, progesterone, zinc, medications like Finasteride.

5b-Reductase may be affected by some of the above listed things as well (often to a lesser degree).

Other factors affecting the production of primary reproductive and adrenal hormones:

- Increased Cortisol: stress, inflammation, Cushing's Disease, obesity
- Decreased Cortisol: glucocorticoid use, opioid use, Addison's Disease, Accutane, chronic marijuana use
- Increased DHEA: PCOS, acute stress, Bupropion (Wellbutrin), Alprazolam (Xanax), ADD meds
- Decreased DHEA: aging, rapid weight loss, Venlafaxine/Mirtazapine, opioids, glucocorticoids, hormonal birth control, antipsychotic meds, estrogens, diabetes meds
- Increased Testosterone: PCOS, HCG, HGH, L-Dopa, Climiphene Citrate (Clomid)
- Decreased Testosterone: obesity, opioids, hormonal birth control, acute illness, aging, high insulin, steroid use
- Increased Estrogens: PCOS, inflammation, pregnancy, DHEA/testosterone supplementation
- Decreased Estrogens: hormonal birth control, ovarian failure (menopause), opioids, anorexia, underweight
- Increased Progesterone: pregnancy, pregnenolone supplementation (increases urine progesterone metabolites, not actual circulating progesterone), Vitex (chaste tree berry)
- Decreased Progesterone: hormonal birth control, stress, high insulin, opioids, NSAID use >10 days, anovulation, luteal phase defect, high prolactin, underweight, hypothyroid, hormonal IUD (Mirena)

Jessica Ehrlich
FINAL REPORT
11/16/2017

Precision Analytical (Raymond Grimsbo, Lab Director)
3138 Rivergate Street #301C
McMinnville, OR 97218

Provider Notes

How to read the DUTCH report

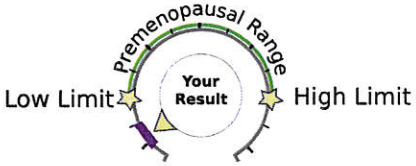
The graphic dutch dials in this report are intended for quick and easy evaluation of which hormones are out of range. Results below the left star are shaded yellow and are below range (left). Results between the stars and shaded green are within the reference range (middle). Results beyond the second star and shaded red are above the reference range (right). Some of these hormones also change with age, and the age-dependent ranges provided should also be considered.

Low Example

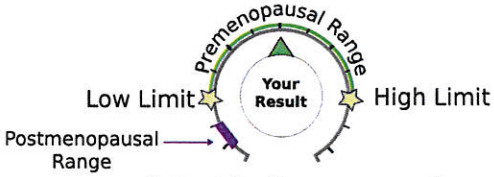
Normal Example

High Example

For female reproductive hormones, a purple band is present on the dutch dials. This band represents the expected levels (reference range) for postmenopausal (or non-cycling) women.



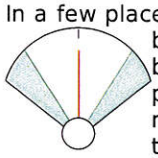
Low for Premenopausal
Normal for Postmenopausal



Normal for Premenopausal
High for Postmenopausal

High for Premenopausal
High for Postmenopausal

In a few places on the graphical pages, you will see fan-style gauges. For sex hormones, you will see one for the balance between 5a/5b metabolism as well as methylation. For adrenal hormones, you will see one to represent the balance between cortisol and cortisone metabolites. These indexes simply look at the ratio of hormones for a preference. An average or "normal" ratio between the two metabolites (or groups of metabolites) will give a result in the middle (as shown here). If the ratio between the metabolites measured is "low" the gauge will lean to the left and similarly to the right if the ratio is higher than normal.



Patient or Sample Comments

Throughout the provider comments you may find some comments specific to your situation or results. These comments will be found in this section or within another section as appropriate. Comments in other sections that are specific to your case will be in **bold**.

The patient reports no menstrual cycles.

The patient reports significant symptoms of androgen deficiency.

The patient reported significant fatigue in the afternoon/evening, but not in the morning.

Progesterone Metabolism

The primary role of progesterone is to balance the strong effects of estrogen. Progesterone metabolites are measured and reflect progesterone levels well because very little progesterone is found in urine, so b-Pregnanediol is typically used as a surrogate marker because it is the most abundant metabolite, but we also test the corresponding a-pregnanediol. The average of the two metabolites is reported for progesterone. If levels are in the lower part of the reference range compared to estrogen levels, symptoms of too much estrogen may occur.
When ordering the DUTCH Complete, you will see Progesterone Serum Equivalent on the summary page 1. The urine metabolites of progesterone have been proven to correlate strongly enough to serum progesterone to provide this value. The correlation is the strongest for values within the premenopausal luteal range. Urine metabolites can at times result in somewhat higher serum equivalent results in the postmenopausal range. For this reason the postmenopausal Serum Equivalent range is slightly higher than typical serum ranges. NOTE: If progesterone is taken orally (also with sublingual), these metabolites are elevated from gut metabolism and results do NOT accurately reflect serum levels.

Androgen Metabolism

When evaluating androgen levels, it is important to assess the following:

- **The status (low, normal or high?) of DHEA:**

DHEA and androstenedione are made almost exclusively by the adrenal gland (although a smaller amount is made in the ovaries). These hormones appear in urine as DHEA-S (DHEA-Sulfate), androsterone and etiocholanolone. The best way to assess the total production of DHEA is to add up these three metabolites. This total can be seen on the first page of the DUTCH Complete (and DUTCH Plus). DHEA production decreases quite significantly with age. Age-dependent ranges can be seen on the graphical page of results.

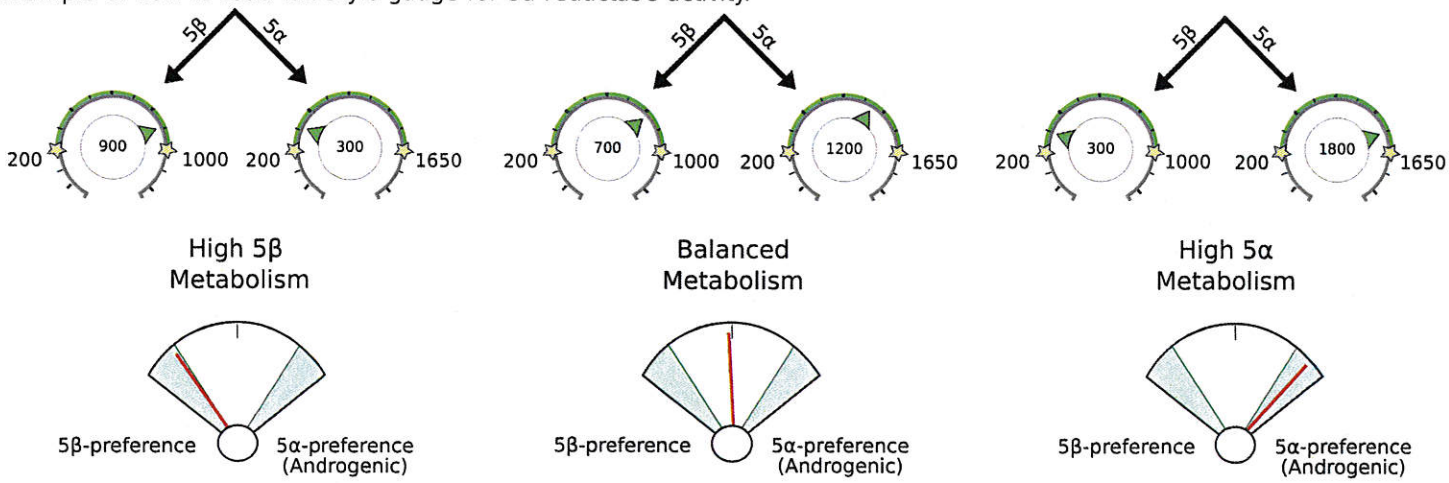
- **The status (low, normal or high?) of testosterone:**

Females make most of their DHEA in the adrenal gland and a fraction of that DHEA trickles down metabolically to testosterone. For premenopausal women, some testosterone is also made by the ovaries. Levels of testosterone do drop somewhat with age, but not to the degree that DHEA decreases.

- **The metabolic preference for the 5a (5-alpha) or 5b (5-beta) pathway:**

5a-reductase converts testosterone into 5a-DHT (DHT), which is even more potent (~3x) than testosterone. High levels of DHT can lead to symptoms associated with too much testosterone. Metabolites created down the 5b-pathway are significantly less androgenic than their 5a counterparts. In the examples below, the example on the left shows a patient with 5b-metabolism preference. A patient with a pattern like the example on the right may have high androgen symptoms even though the hormones are in the normal range because of the likely preference for turning a lot of her testosterone into DHT. The fan-style gauge below the hormones shows the 5a or 5b preference based on etiocholanolone (5b) and androsterone (5a) results. Progesterone metabolites are also metabolized by 5a and 5b enzymes and the balance between its two metabolites can be useful to confirm a 5a or 5b preference.

Example of how to read fan-style gauge for 5a-reductase activity:



It is important to consider DHEA and testosterone production, 5a-metabolism patterns as well as the patient symptoms. For example, a woman with higher levels of DHEA and testosterone will often have high androgen symptoms (facial hair, thinning scalp hair, etc.) exacerbated by 5a-metabolism. If, on the other hand, she prefers 5b-metabolism she may not express high androgen symptoms in spite of higher levels of testosterone because 5b is the less androgenic pathway.
Testosterone levels may be better understood by also considering its downstream metabolites (5a-androstanediol, 5b-androstanediol). Technically, these metabolites can also be formed from DHEA metabolites without going through the testosterone pathway, but they generally tend to correlate with testosterone production.
You will also see levels of epi-testosterone, which is not androgenic like testosterone. It happens to be produced in about the same concentrations as testosterone (this is an approximate relationship). This can be helpful to assess testosterone therapy and rare cases where testosterone may have other complexities.

Estrogen Metabolism

When evaluating estrogen levels, it is important to assess the following:

- **The status (low, normal or high?) of estrogen production:**

Levels of the primary ovarian product, estradiol (the strongest estrogen), as well as "total estrogens" may be considered. For women not on HRT, consider the appropriate range (premenopausal or postmenopausal).

- **Phase I Metabolism:**

Estrogen is metabolized (primarily by the liver) down three phase I pathways. The 2-OH pathway is considered the safest because of the anti-cancer properties of 2-OH metabolites. Conversely, the 4-OH pathway is considered the most genotoxic as its metabolites can create reactive products that damage DNA. The third pathway, 16-OH creates the most estrogenic of the metabolites (although still considerably less estrogenic than estradiol) - 16-OH-E1. If overall estrogen levels are high, production of 16-OH-E1 may exacerbate high estrogen symptoms. Similarly, a woman with very low levels of estrogens, may have less low estrogen symptoms if 16-OH metabolism is preferred. For example Armamento-Villareal showed that a higher 2-OH-E1/16-OH-E1 ratio correlated to bone loss (a low estrogen symptom). Estriol is thought of as a safer (weaker) estrogen metabolite, but it is important to remember that estriol is actually 16-OH-E2, so generally patients that make a lot of the potentially protective/weak estriol may also make a lot of the estrogenic 16-OH-E1.
When evaluating phase I metabolism, it may be important to look at the ratios of the three metabolites to see which pathways are preferred relative to one another. It may also be important to compare these metabolites to the levels of the parent hormones (E1, E2). If the ratios of the three metabolites are favorable but overall levels of metabolites are much lower than E1 and E2, this may imply sluggish phase I clearance of estrogens, which can contribute to high levels of E1 and E2. Similarly, patients with excessive phase I metabolism may have low E1 and E2 levels because of high rates of clearance (as opposed to simply not making a lot of estrogen).
The pie chart will assist you in comparing the three pathway options of phase I metabolism compared to what is "normal." 2-OH metabolism can be increased by using products containing D.I.M. or I-3-C. These compounds are found (or created from) in cruciferous vegetables and are known for promoting this pathway.

Phase I metabolism looks good for the patient with a preference for 2-OH metabolism. Products to increase 2-OH metabolism more would only be considered if E1 and E2 are elevated relative to 2-OH esrogens. Products that push for the 2-OH pathway also lower E1 and E2 levels.

- **Methylation (part of phase II metabolism) of estrogens:**

After phase I metabolism, both 4-OH and 2-OH (not 16-OH) estrogens can be deactivated and eliminated by methylation. The methylation-activity index shows the patient's ratio of 2-Methoxy-E1 / 2-OH-E1 compared to what is expected. Low methylation can be caused by low levels of nutrients needed for methylation and/or genetic abnormalities (COMT, MTHFR). The COMT enzyme responsible for methylation requires magnesium and methyl donors. Deficiencies in folate or vitamin B6 or B12 can cause low levels of methyl donors. MTHFR genetic defects can make it more difficult for patients to make sufficient methyl donors. Genetic defects in COMT can make methylation poor even in the presence of adequate methyl donors.

DUTCH Adrenal

The HPA-Axis refers to the communication and interaction between the hypothalamus (H) and pituitary (P) in the brain down to the adrenal glands (A) that sit on top of your kidneys. When a physical or psychological stressor occurs, the hypothalamus tells the pituitary to make ACTH, a hormone. ACTH stimulates the adrenal glands to make the stress hormone, cortisol and to a lesser extent DHEA and DHEA-S. Normally, the HPA-axis production follows a daily pattern in which cortisol rises rather rapidly in the first 10-30 minutes after waking in order to help with energy, then gradually decreases throughout the day so that it is low at night for sleep. The cycle starts over the next morning. Abnormally high activity occurs in Cushing's Disease where the HPA-axis is hyper-stimulated causing cortisol to be elevated all day. The opposite is known as Addison's Disease, where cortisol is abnormally low because it is not made appropriately in response to ACTH's stimulation. These two conditions are somewhat rare. Examples of more common conditions related to less severely abnormal cortisol levels include fatigue, depression, insomnia, fibromyalgia, anxiety, inflammation and more.

Only a fraction of cortisol is "free" and bioactive. This fraction of cortisol is very important, but levels of metabolized cortisol best represent overall production of cortisol therefore both should be taken into account to correctly assess adrenal function.

When evaluating cortisol levels, it is important to assess the following:

- **The overall up-and-down pattern of free cortisol throughout the day, looking for low and high levels:**

Abnormal results should be considered along with related symptoms. Remember that with urine results, the "waking" sample reflects the night's total for free cortisol. The sample collected two hours after waking captures the cortisol awakening response, which is typically the time with the most cortisol secretion.

- **The sum of the free cortisol as an expression of the overall tissue cortisol exposure:**

This total of four free cortisol measurements is the best way to assess the total of free cortisol throughout the day, and this result correlates reasonably well to a true 24-hour urine free cortisol. Do be aware that this measurement does not take into account transitory shifts in cortisol in the late morning or early afternoon.

- **The total level of cortisol metabolites:**

We call this calculation "Metabolized Cortisol" which is the sum of a-THF, b-THF and b-THE (the most abundant cortisol metabolites). While free cortisol is the best assessment for tissue levels of cortisol, it only represents 1-3% of the total produced. The majority of cortisol results in a urine metabolite and the total of these metabolites best represents the total glandular output of cortisol for the day. When overall production is much higher than free cortisol levels, cortisol clearance may be increased (as seen in hyperthyroidism, obesity, etc.) The most common reason for sluggish cortisol clearance (assumed when free cortisol levels are much higher than metabolized cortisol) is low thyroid.

Overall cortisol levels are appropriate as both free and metabolized cortisol levels are within range. If the diurnal pattern of the free cortisol is as expected, this implies normal HPA-Axis cortisol production.

- **A potential preference for cortisol or cortisone (the inactive form):**

Looking at the comparison between the total for free cortisol and free cortisone is NOT the best indication of a person's preference for cortisol or cortisone. The kidney converts cortisol to cortisone in the local tissue. This localized conversion can be seen by comparing cortisol (free) and cortisone levels. To see the patient's preference systemically, it is best to look at which *metabolite* predominates (THF or THE). This preference can be seen in the fan style gauge. This is known as the 11b-HSD index. The enzyme 11b-HSD II converts cortisol to cortisone in the kidneys, saliva gland and colon. 11b-HSD I is more active in the liver, fat cells and the periphery and is responsible for reactivating cortisone to cortisol. Both are then metabolized by 5a-reductase to become tetrahydrocortisol (THF) and tetrahydrocortisone (THE) respectively.

Melatonin (measured as 6-OHMS)

Melatonin is not technically an adrenal or sex hormone however it is highly involved in the entire endocrine system. It is made in small amounts in the pineal gland in response to darkness and stimulated by Melanocyte Stimulating Hormone (MSH). A low MSH is associated with insomnia, an increased perception of pain, and mold exposure. Pineal melatonin (melatonin is also made in significant quantities in the gut) is associated with the circadian rhythm of all hormones (including female hormone release). It is also made in small amounts in the bone marrow, lymphocytes, epithelial cells and mast cells. Studies have shown that a urine sample collected upon waking has levels of 6-Hydroxymelatonin-sulfate (6-OHMS) that correlate well to the total levels of melatonin in blood samples taken continuously throughout the night. The DUTCH test uses the waking sample only to test levels of melatonin production.

Low melatonin levels may be associated with insomnia, poor immune response, constipation, weight gain or increased appetite. Elevated melatonin is usually caused by ingestion of melatonin through melatonin supplementation or eating melatonin-containing foods. Elevated melatonin production that is problematic is rare, but levels can be higher in patients with Chronic Fatigue Syndrome and may be phase shifted (peaking later) in some forms of depression.

8-OHdG (8-Hydroxy-2-deoxyguanosine)

8-OHdG (8-hydroxy-2-deoxyguanosine) results can be seen on page 4 of the DUTCH Complete (or DUTCH Plus) report. It is a marker for estimating DNA damage due to oxidative stress (ROS creation). 8-OHdG is considered pro-mutagenic as it is a biomarker for various cancer and degenerative disease initiation and promotion. It can be increased by chronic inflammation, increased cell turnover, chronic stress, hypertension, hyperglycemia/pre-diabetes/diabetes, kidney disease, IBD, chronic skin conditions (psoriasis/eczema), depression, atherosclerosis, chronic liver disease, Parkinson's (increasing levels with worsening stages), Diabetic neuropathy, COPD, bladder cancer, or insomnia. Studies have shown higher levels in patients with breast and prostate cancers. When levels are elevated it may be prudent to eliminate or reduce any causes and increase the consumption of antioxidant containing foods and/or supplements.
The reference range for 8-OHdG is a more aggressive range for Functional Medicine that puts the range limit at the 80th percentile for each gender. A classic range (average plus two standard deviations) would result in a range of 0-6ng/mg for women and 0-10ng/mg for men. Seeking out the cause of oxidative stress may be more crucial if results exceed these limits.

Urine Hormone Testing - General Information

What is actually measured in urine? In blood, most hormones are bound to binding proteins. A small fraction of the total hormone levels are "free" and unbound such that they are active hormones. These free hormones are not found readily in urine except for cortisol and cortisone (because they are much more water soluble than, for example, testosterone). As such, free cortisol and cortisone can be measured in urine and it is this measurement that nearly all urinary cortisol research is based upon. In the DUTCH Adrenal Profile the diurnal patterns of free cortisol and cortisone are measured by LC-MS/MS.

All other hormones measured (cortisol metabolites, DHEA, and all sex hormones) are excreted in urine predominately after the addition of a glucuronide or sulfate group (to increase water solubility for excretion). As an example, Tajic (Natural Sciences, 1968 publication) found that of the testosterone found in urine, 57-80% was testosterone-glucuronide, 14-42% was testosterone-sulfate, and negligible amounts (<1% for most) was free testosterone. The most likely source of free sex hormones in urine is from contamination from hormonal supplements. To eliminate this potential, we remove free hormones from conjugates (our testing can be used even if vaginal hormones have been given). The glucuronides and sulfates are then broken off of the parent hormones, and the measurement is made. These measurements reflect the bioavailable amount of hormone in most cases as it is only the free, nonprotein-bound fraction in blood/tissue that is available for phase II metabolism (glucuronidation and sulfation) and subsequent urine excretion.
Disclaimer: the filter paper used for sample collection is designed for blood collection, so it is technically considered "research only" for urine collection. Its proper use for urine collection has been thoroughly validated.

Reference Range Determination and Updates (11.15.2017)

We aim to make the reference ranges for our DUTCH tests as clinically appropriate and useful as possible. This includes the testing of thousands of healthy individuals and combing through the data to exclude those that are not considered "healthy" or "normal" with respect to a particular hormone. As an example, we only use a premenopausal woman's data for estrogen range determination if the associated progesterone result is within the luteal range (days 19-21 when progesterone should be at its peak). We exclude women on birth control or with any conditions that may be related to estrogen production. Over time the database of results for reference ranges has grown quite large. This has allowed us to refine some of the ranges to optimize for clinical utility. The manner in which a metabolite's range is determined can be different depending on the nature of the metabolite. For example, it would not make clinical sense to tell a patient they are deficient in the carcinogenic estrogen metabolite, 4-OH-E1 therefore the lower range limit for this metabolite is set to zero for both men and women. Modestly elevated testosterone is associated with unwanted symptoms in women more so than in men, so the high range limit is set at the 80th percentile in women and the 90th percentile for men. Note: the 90th percentile is defined as a result higher than 90% (9 out of 10) of a healthy population.

Classic reference ranges for disease determination are usually calculated by determining the average value and adding and subtracting two standard deviations from the average, which defines 95% of the population as being "normal." When testing cortisol, for example, these types of two standard deviation ranges are effective for determining if a patient might have Addison's (very low cortisol) or Cushing's (very high cortisol) Disease. Our ranges are set more tightly to be optimally used for Functional Medicine practices.

Below you will find a description of the range for each test along with any updates (as of 11.15.2017). Some of the ranges that have changed as of 11.15.2017 represent a fine tuning of ranges following review using a new, expanded data set. Most of the changes are due to the implementation of new age-dependent ranges or changes to the population percentile used for a range limit. For example, after reviewing clinical data, we have decided to change the range limit for DHEA-S from the 80th to the 90th percentile to account for the broader range of data seen for DHEA-S compared to other DHEA metabolites.

FEMALE RANGES	Reference Ranges prior to 11.15.2017				New ranges as of 11.15.2017			
	Low%	High%	Low	High	Low%	High%	Low	High
b-Pregnanediol	20%	90%	450	2300	20%	90%	600	2000
a-Pregnanediol	20%	90%	120	740	20%	90%	200	740
Estrone	20%	80%	12	26	20%	80%	12	26
Estradiol	20%	80%	1.8	4.5	20%	80%	1.8	4.5
Estriol	20%	80%	5	18	20%	80%	5	18
2-OH-E1	20%	80%	4.6	14.4	20%	80%	5.1	13.1
4-OH-E1	0	80%	0	1.8	0	80%	0	1.8
16-OH-E1	20%	80%	1	3.5	20%	80%	0.7	2.6
2-Methoxy-E1	20%	80%	2	5.5	20%	80%	2.5	6.5
2-OH-E2	0	80%	0	1.2	0	80%	0	1.2
DHEA-S	20%	80%	30	570	20%	90%	20	750
Androsterone	20%	80%	400	1700	20%	80%	200	1650
Etiocholanolone	20%	80%	260	950	20%	80%	200	1000
Testosterone	20%	80%	4	14	20%	80%	2.3	14
5a-DHT	20%	80%	0	8.8	20%	80%	0	6.6
5a-Androstanediol	20%	80%	12	30	20%	80%	12	30
5b-Androstanediol	20%	80%	20	75	20%	80%	20	75
Epi-Testosterone	20%	80%	4.5	22.3	20%	80%	2.3	14
a-THF	20%	90%	75	370	20%	90%	75	370
b-THF	20%	90%	1050	2500	20%	90%	1050	2500
b-THE	20%	90%	1550	3800	20%	90%	1550	3800
Cortisol A (waking)	20%	90%	12	55	20%	90%	12	55
Cortisol B (morning)	20%	90%	38	155	20%	90%	38	155
Cortisol C (~5pm)	20%	90%	7.3	30	20%	90%	7.3	30
Cortisol D (bed)	0	90%	0	14	0%	90%	0	14
Cortisone A (waking)	20%	90%	40	120	20%	90%	40	120
Cortisone B (morning)	20%	90%	90	230	20%	90%	90	230
Cortisone C (~5pm)	20%	90%	32	95	20%	90%	32	95
Cortisone D (bed)	0	90%	0	55	0	90%	0	55
Melatonin	20%	90%	10	85	20%	90%	10	85
8-OHdG	0	90%	0	5.2	0	90%	0	5.2
Calculated Values								
Total DHEA Production	20%	80%	400	3000	20%	80%	500	3000
Total Estrogens	20%	80%	27	62	20%	80%	35	70
Metabolized Cortisol	20%	90%	2750	6500	20%	90%	2750	6500
24hr Free Cortisol	20%	90%	80	230	20%	90%	80	230
24hr Free Cortisone	20%	90%	220	450	20%	90%	220	450

% = population percentile: Example - a high limit of 90% means results higher than 90% of the women tested for the reference range will be designated as "high."

Changed 11.15.2017

Provider Notes: