Accession # 00268794
Male Dutch Plus
,

Last Menstrual Period:

Collection Times:
2017-08-09 06:01AM (S)
2017-08-09 06:31AM (S)
2017-08-09 07:01AM (S)
2017-08-09 05:01AM (S)
2017-08-09 10:01AM (S)
2017-08-09 06:01AM (U)
2017-08-09 08:01AM (U)
2017-08-09 05:01PM (U)
2017-08-09 10:01PM (U)

Ordering physician:
Precision Analytical

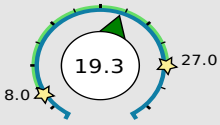
DOB: 1967-08-09
Age: 50
Gender: Male

Hormone Testing Summary

All units are given in ng/mg creatinine

How to read the graphical representation of results

Sex Hormones



Total Estrogen
(Sum of 8 Estrogen Metabolites)

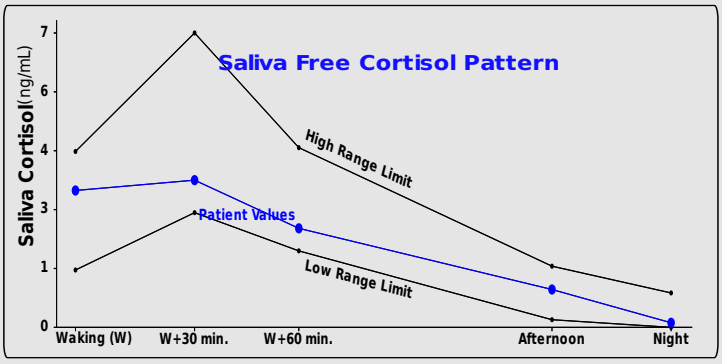
Testosterone

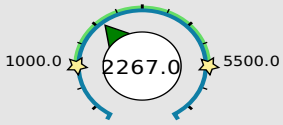
See Pages 2 & 3 for a thorough breakdown of sex hormone metabolites

	Age	Range
Testosterone	18-25	50-115
	26-40	40-95
	41-60	30-80
	>60	25-60
Total DHEA	20-40	2500-5500
Production	40-60	1700-3500
	>60	1000-2500

Adrenal Hormones

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

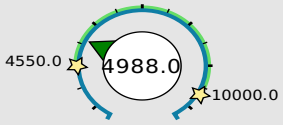




Total DHEA Production
(DHEAS + Etiocholanolone + Androsterone)

Saliva Cortisol Total
(Sum of 5 values)

cortisol metabolism



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

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

Thank you for testing with us!

==========

Please be sure to always read below for any specific lab comments. More detailed comments can be found on page 7.

==========

Your DUTCH Complete report will include a summary (page 1), a list of all of the hormones tested and their ranges (pages 2,4) as well as a graphical representation of the results (pages 3,5). You will also see a steroid pathway for your reference (page 6) 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)
Estrogen Tutorial; Androgen Tutorial; Cortisol Tutorial;
Please note that some of the videos and comments associated with this report do not yet include references to the salivary measurements.

Accession # 00268794
Male Dutch Plus

,

Sex Hormones and Metabolites

Last Menstrual Period:

Collection Times:
2017-08-09 06:01AM (S)
2017-08-09 06:31AM (S)
2017-08-09 07:01AM (S)
2017-08-09 05:01AM (S)
2017-08-09 10:01AM (S)
2017-08-09 06:01AM (U)
2017-08-09 08:01AM (U)
2017-08-09 05:01PM (U)
2017-08-09 10:01PM (U)

Ordering physician:
Precision Analytical

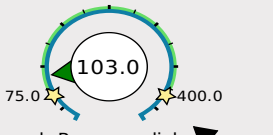
DOB: 1967-08-09
Age: 50
Gender: Male

Category	Test		Result	Units	Normal Range
Progesterone Metabolites					
	b-Pregnanediol	Low end of range	103.0	ng/mg	75 - 400
	a-Pregnanediol	Within range	47.0	ng/mg	20 - 130
Androgen Metabolites					
	DHEAS	Low end of range	64.0	ng/mg	60 - 2000
	Androsterone	Within range	1645.0	ng/mg	640 - 3000
	Etiocholanolone	Low end of range	559.0	ng/mg	460 - 1700
	Testosterone	Low end of range	37.1	ng/mg	25 - 115
	5a-DHT	Within range	11.6	ng/mg	9 - 16.7
	5a-Androstanediol	Within range	78.9	ng/mg	50 - 130
	5b-Androstanediol	Low end of range	92.8	ng/mg	65 - 250
	Epi-Testosterone	Low end of range	37.0	ng/mg	25 - 115
Estrogen Metabolites					
	Estrone(E1)	Within range	9.5	ng/mg	4 - 12
	Estradiol(E2)	Within range	1.1	ng/mg	0.5 - 1.6
	Estriol(E3)	Low end of range	2.3	ng/mg	2 - 6
	2-OH-E1	Above range	4.4	ng/mg	0 - 3
	4-OH-E1	Above range	0.5	ng/mg	0 - 0.5
	16-OH-E1	Within range	0.5	ng/mg	0 - 0.8
	2-Methoxy-E1	Above range	2.0	ng/mg	0 - 2
	2-OH-E2	Within range	0.31	ng/mg	0 - 0.5

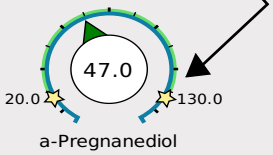
HOW TO READ YOUR RESULTS: Hormones are presented on this page graphically in the order the body metabolizes them. Arrows represent conversion from one hormone to another. The stars represent the low and high limits of the reference ranges (see example, right). The number in the middle is your result.

Pregnenolone

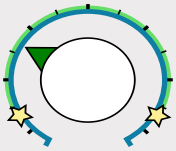
Progesterone Metabolism



b-Pregnanediol



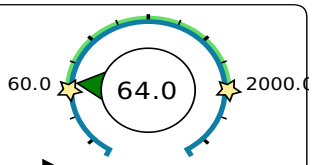
a-Pregnanediol



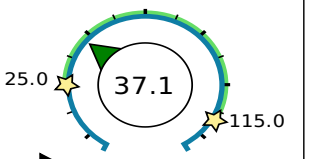
Progesterone

A weighted average of progesterone metabolites
Progesterone itself is not found in urine in measurable levels

Androgen Metabolism



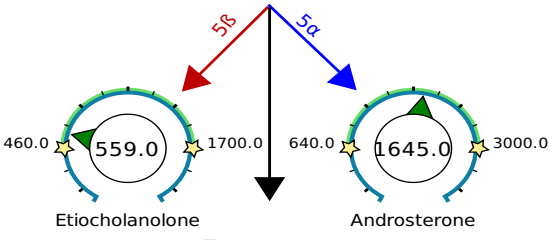
DHEA → DHEAS



Androstenedione → Testosterone

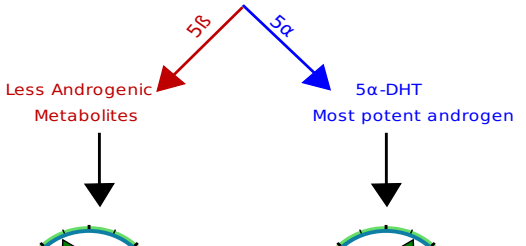
Age	Age-Dependent Ranges	
18-25	50-115	**Testosterone**
26-40	40-95	
41-60	30-80	
>60	25-60	
20-40	100-2000	**DHEAS**
40-60	30-300	
>60	20-100	
20-40	1000-3000	**Androsterone**
40-60	500-2500	
>60	250-2000	
20-40	500-1700	**Etiocholanolone**
40-60	350-1300	
>60	250-1000	

Androstenedione

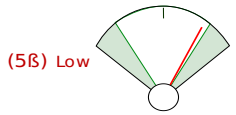


Etiocholanolone — Androsterone

Testosterone



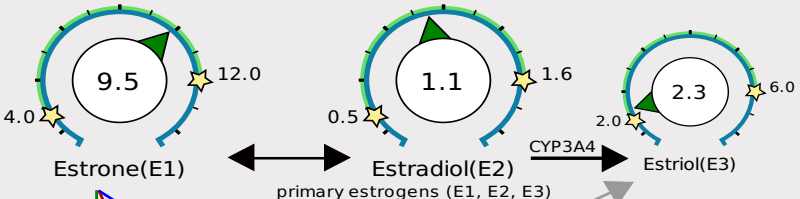
5b-Androstanediol — 5a-Androstanediol



5a-Reductase Activity

5α-Reductase Activity is an overall score of the 5α (more androgenic) vs. 5ß (less androgenic) metabolites of androstenedione and testosterone.

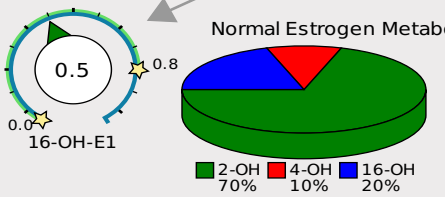
Estrogen Metabolism



Estrone(E1) ↔ Estradiol(E2) — CYP3A4 → Estriol(E3)

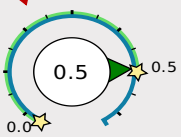
primary estrogens (E1, E2, E3)

CYP3A4 → 16-OH-E1

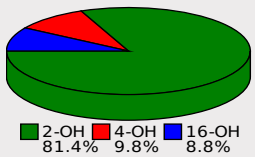


Normal Estrogen Metabolism

CYP1B1 → 4-OH-E1



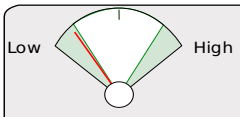
Patient Estrogen Metabolism



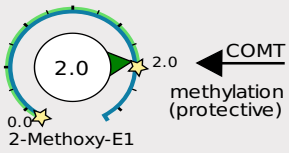
CYP1A1 (protective pathway)

COMT → 4-Methoxy-E1
(Protective, but not enough in urine to measure)

4-OH-E1 → If not methylated, 4-OH-E1 can bind to and damage DNA

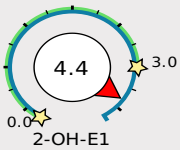


Methylation-activity
2-Methoxy/2-OH



2-Methoxy-E1

COMT
methylation (protective)



2-OH-E1

Accession # 00268794
Male Dutch Plus

,

Advanced Adrenal Assessment

Last Menstrual Period:

Collection Times:
2017-08-09 06:01AM (S)
2017-08-09 06:31AM (S)
2017-08-09 07:01AM (S)
2017-08-09 05:01AM (S)
2017-08-09 10:01AM (S)
2017-08-09 06:01AM (U)
2017-08-09 08:01AM (U)
2017-08-09 05:01PM (U)
2017-08-09 10:01PM (U)

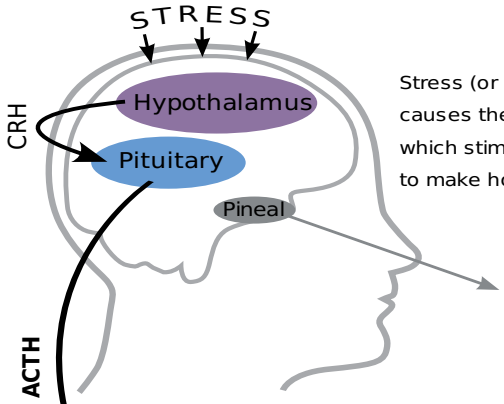
Ordering physician:
Precision Analytical

DOB: 1967-08-09
Age: 50
Gender: Male

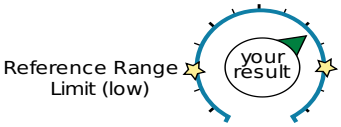
Category	Test		Result	Units	Normal Range
Saliva Free Cortisol and Cortisone					
	Saliva Cortisol - Waking (W)	Within range	3.58	ng/mL	1.5 - 4.6
	Saliva Cortisol - W+30 min.	Low end of range	3.85	ng/mL	3 - 7.7
	Saliva Cortisol - W+60 min.	Within range	2.59	ng/mL	2 - 4.7
	Saliva Cortisol - Afternoon	Within range	0.99	ng/mL	0.2 - 1.6
	Saliva Cortisol - Night	Low end of range	0.12	ng/mL	0 - 0.9
	Saliva Cortisone - Waking (W)	Within range	11.58	ng/mL	6.7 - 13.3
	Saliva Cortisone - W+30 min.	Within range	12.7	ng/mL	10.3 - 18.8
	Saliva Cortisone - W+60 min.	Below range	9.19	ng/mL	9.2 - 15.3
	Saliva Cortisone - Afternoon	Within range	4.86	ng/mL	2.1 - 8.3
	Saliva Cortisone - Night	Low end of range	0.91	ng/mL	0 - 5.6
	Saliva Cortisol Total	Within range	11.13	ng/mL	8 - 18
	Saliva Cortisone Total	Within range	39.2	ng/mL	33 - 55
Creatinine					
	Creatinine A (Waking)	Within range	2.05	mg/ml	0.3 - 3
	Creatinine B (Morning)	Within range	1.5	mg/ml	0.3 - 3
	Creatinine C (Afternoon)	Within range	0.9	mg/ml	0.3 - 3
	Creatinine D (Night)	Within range	1.63	mg/ml	0.3 - 3
Cortisol Metabolites and DHEAS					
	a-Tetrahydrocortisol (a-THF)	Within range	494.0	ng/mg	175 - 700
	b-Tetrahydrocortisol (b-THF)	Low end of range	2136.0	ng/mg	1750 - 4000
	b-Tetrahydrocortisone (b-THE)	Low end of range	2358.0	ng/mg	2350 - 5800
	Metabolized Cortisol (THF+THE)	Low end of range	4988.0	ng/mg	4550 - 10000
	DHEAS	Low end of range	64.0	ng/mg	60 - 2000

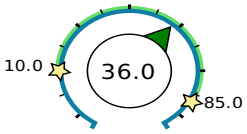
DUTCH Complete Extras

Category	Test		Result	Units	Normal Range
Melatonin (*measured as 6-OH-Melatonin-Sulfate)					
	Melatonin* (Waking)	Within range	36.0	ng/mg	10 - 85
Oxidative Stress / DNA Damage, measured as 8-Hydroxy-2-deoxyguanosine (8-OHdG)					
	8-OHdG (Waking)	Within range	3.9	ng/mg	0 - 8.8



Stress (or inflammation) causes the brain to release ACTH, which stimulates the adrenal glands to make hormones

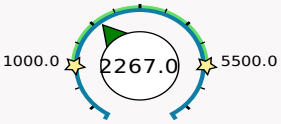




Melatonin* (Waking)

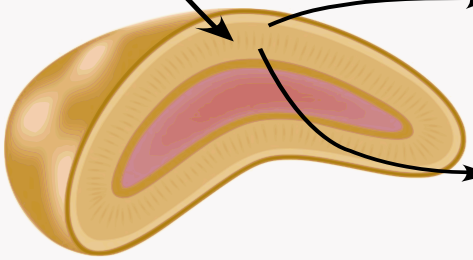
Total DHEA Production

Age	Range
20-40	2500-5500
40-60	1700-3500
>60	1000-2500



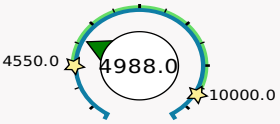
Total DHEA Production
(DHEAS + Etiocholanolone + Androsterone)

Adrenal Gland



DHEA

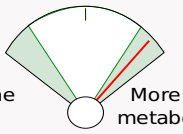
A patient's catabolic vs anabolic balance can be estimated by observing relative DHEA (anabolic) vs cortisol (catabolic) production



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

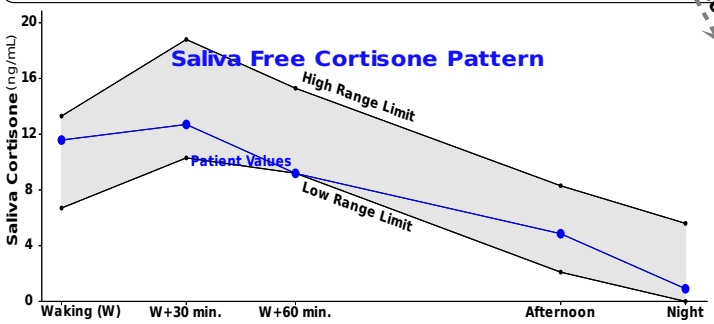
Cortisol **Cortisol Metabolism**

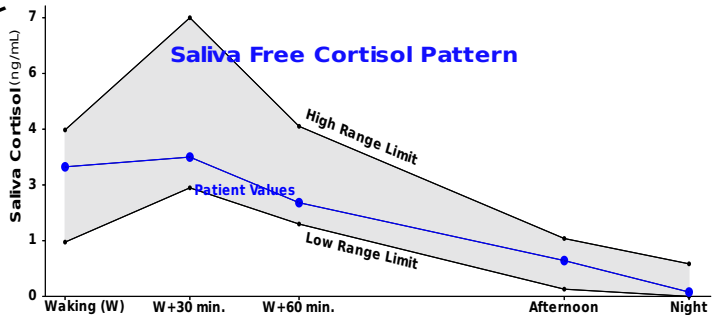
Circulating Free Cortisol

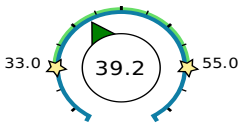


More cortisone metabolites (THE) — More cortisol metabolites (THF)

NOTE: This 11b-HSD index measures the balance of cortisol and cortisone metabolites which best reflects the overall balance of active cortisol and inactive cortisone systemically.

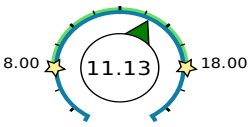






Saliva Cortisone Total
(Sum of 5 values)

Cortisol and Cortisone interconvert (11b-HSD)



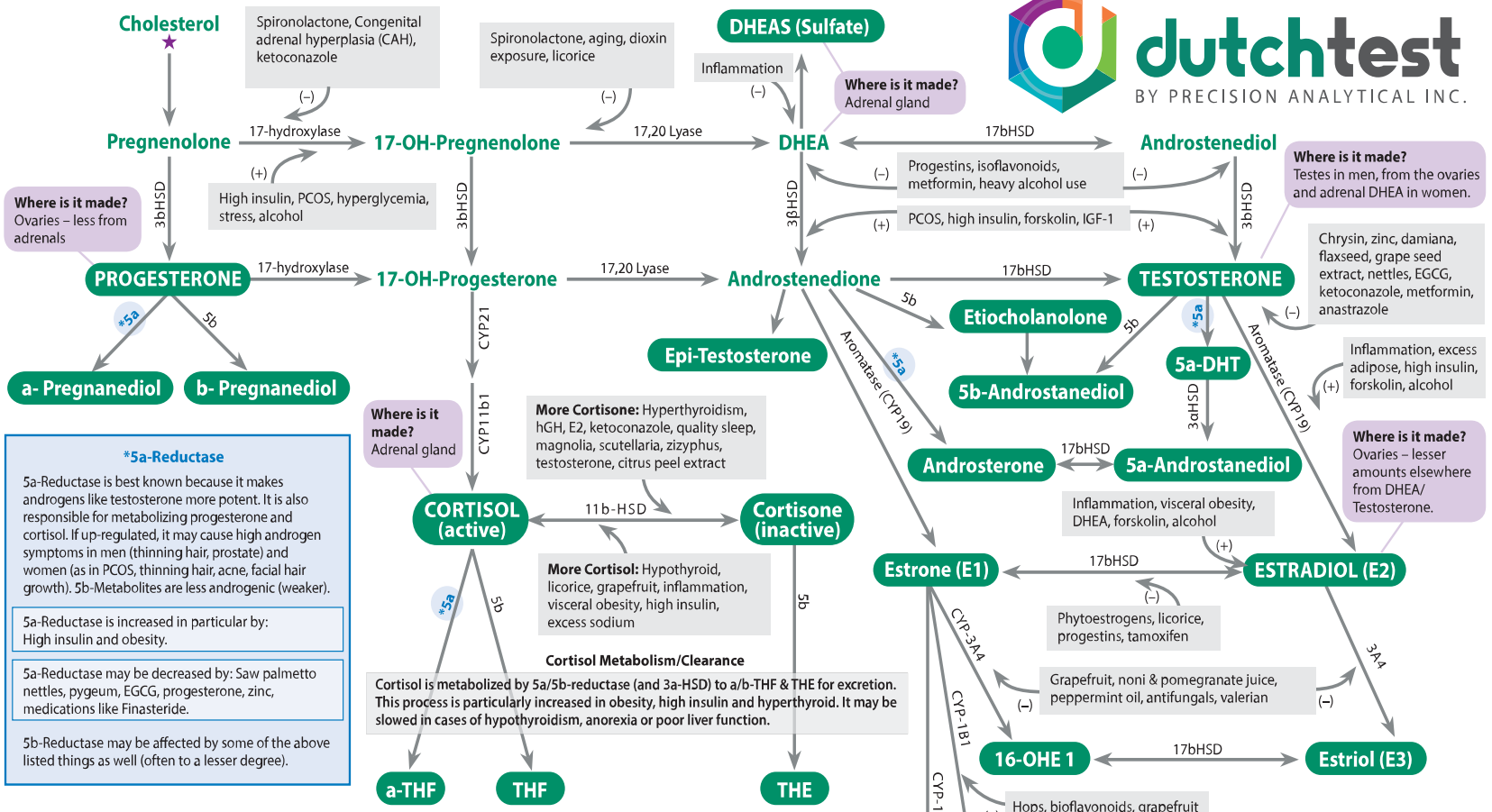
Saliva Cortisol Total
(Sum of 5 values)

The Cortisol Awakening Response (CAR) is the rise in salivary cortisol between the waking sample and the sample collected 30 (as well as 60) minutes later. This "awakening response" is essentially a "mini stress test" and is a useful measurement in addition to the overall up-and-down (diurnal) pattern of free cortisol throughout the day. **This patient shows a waking cortisol of 3.6 and an increase to 3.8 after 30 minutes. This is an increase of 0.27ng/mL or 7.5%.** Expected increases differ depending on the methods used. Preliminary research shows that 50-150% or 1.5-5.0ng/mL increases are common. These guidelines are considered research only.
This patient shows a salivary cortisol of 2.6 measured 60 minutes after waking. Generally this result is a little higher than the waking sample but is not in this case. To date, data suggests that expected results may be 0-80% higher, and this guideline is considered for research only.

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.



*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).

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.

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)

CLIA Lic. #38D2047310
DutchTest.com

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

Provider Notes

Thank you for testing with us! If this is your first report, you are encouraged to watch our educational videos on how to read the report. There are hyperlinks to these videos on the first page of a DUTCH Complete or in these comments (below). The videos can also be seen by going to www.DutchTest.com and visiting the video library. Comments in the report that are specific to the patient ARE IN ALL CAPS or may be **bold.** The other information is general information that we hope you will find useful in understanding the patient's results. These results are not intended to diagnose any specific conditions. Treatments based on results should be made by a qualified healthcare provider.

The following video link(s) may help those new to dutch testing to understand the results. If you only have a hardcopy of the results, the video names can be easily found in our video library at www.DutchTest.com. These results and videos are NOT intended to diagnose or treat specific disease states.

Androgen Metabolism: Testosterone is made in the testis and the adrenal glands however in men the adrenal production is a somewhat insignificant fraction. a-DHT (a-dihydrotestosterone) is the most potent androgen (3X more than testosterone), but it is primarily made within the liver and target cells (it is a paracrine hormone) and not by the gonads. a-DHT is subsequently deactivated to a-androstanediol within target tissues and then conjugated (glucuronidation) for excretion. As such, a-androstanediol may better represents a-DHT even though its metabolic precursor is more biologically active and well known however we do report both on the test. Only a fraction of a-DHT formed actually enters circulation as a-DHT (Toscano, 1987). The corresponding beta metabolites (for example b-DHT) are not androgenic.

Androgens help to promote proper sexual desire and function, and generally contribute to attributes that are typically more pronounced in males than females (general and sexual aggression, muscle mass, increased facial/body hair, reduction of fat deposition, etc). As males age, they make less testosterone. Androgens are turned into estrogens (for men and women) so assessing metabolism also includes looking at estrogen levels.
Note: a-androstanediol and b-androstanediol ranges have been updated as of 7.22.16 due to a recalibration.

5a-Reductase Activity: The competing enzymes 5a and 5b-reductase act on the androgens androstenedione (creating androsterone and etiocholanolone located under the progesterone picture) and testosterone (creating a-DHT and b-DHT). They also metabolize progesterone, and cortisol. The alpha metabolites of androstenedione and testosterone are far more androgenic than their beta counterparts. Consequently, increased 5a-reductase activity may be accompanied by clinical signs of androgenicity (excess facial hair growth, scalp hair loss, acne, irritability, oily skin, prostate issues in men…etc). If the patient heavily favors the 5a pathway and there are concerns of excess androgenicity (or prostate cancer risk), this may be worth addressing.

Estrogen Metabolism: While usually considered “female” hormones, estrogens are present in males also. In men elevated estrogen levels have been associated with weight gain, breast development, mood swings, cardiovascular and prostate problems. The primary concern for male patients is if they are making too much. Estrogens are produced from androstenedione and testosterone via a process called aromatization.

Most estrogen is metabolized down into the healthier 2-OH pathway. These 2-OH metabolites are considered protective in women (from breast cancer) but this is also true of men with respect to prostate cancer. It is ideal if the 2-OH pathway (from the 2nd pie chart) is heavily favored over the more potent 16-OH estrogens or the carcinogenic 4-OH estrogens. It is our position that the ratio of 2:16 OHE1 is not as relevant as has been thought historically (Obi, 2011). Providers may still wish to use this index and it can be calculated by simply dividing the two numbers. A male reference range for the ratio with our methodology is 2.6-6.6.

The methylation activity gauge shows how effectively the body makes methoxy estrogens from hydroxyestrogens. Normal or high methylation activity is important in protecting the body from the harmful 4-OH estrogens made in phase 1 detoxification.

Progesterone levels are of marginal value in men, although deficiency can be associated with some clinical conditions such as depression, fatigue, and low libido.

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 represents 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.
-The sum of the free cortisol as an expression of the overall tissue cortisol exposure:
-The total level of cortisol metabolites: We call this calculation "Metabolized Cortisol" which is the sum of a-THF, b-THF and b-THE. 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.
-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 saliva gland converts cortisol to cortisone in the local tissue. This localized conversion can be seen by comparing cortisol 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 gauge below metabolized cortisol. 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.
-The Cortisol Awakening Response (CAR): The unique feature of the DUTCH Plus is the inclusion of the CAR assessment. The response to waking adds one more piece to HPA-axis function. In some cases overall levels of free cortisol may be normal, but the response to stress may be under or overactive. Reasons for a lower CAR might include: an underactive HPA Axis, excessive psychological burnout, seasonal affective disorder (SAD), sleep apnea or poor sleep in general, PTSD, and "chronic fatigue" patients. An elevated CAR can be a result of an over-reactive HPA axis, ongoing job-related stress (anticipatory stress for the day), glycemic dysregulation, pain (ie. waking with painful joints or a migraine), and general depression (not SAD). Scientific literature points to the magnitude of the morning cortisol increase as being connected to HPA-axis health whether the overall production of cortisol is low, normal or high.

DUTCH welcomes 8-OHdG

8-OHdG (8-hydroxy-2-deoxyguanosine) results can be seen on page 4 of the DUTCH Complete 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.

Reading the Report: The first page of the Dutch Complete lab report is a summary page while the second page of the Dutch Complete lab report and first page of the Dutch sex hormone and Dutch adrenal test are a classic lab report showing each result and the respective range of each hormone. Reference ranges shown are those of young healthy individuals. The graphical representation of results on the page that follows allows the viewing of hormone results within the biochemical flowchart to more easily see the relative level of each hormone. The gauge format shows the patient result (represented by the "needle" of the gauge) and the area between the stars represents the reference range.
Reference ranges are typically set at the 20th to the 80th percentile of young, healthy individuals (DHEAS for example). This means that a result at the low end of a range is lower than 80 percent of young, healthy individuals. Likewise a result at the high end of a range is higher than 80 percent of the population. Some reference ranges are set more widely. For example, slightly elevated progesterone is not generally considered problematic, so its metabolites have reference ranges that extend further (90th percentile instead of 80th).
The "fan" style gauges are used for indexes/ratios such as on 5a-reductase activity, cortisol/cortisone, and estrogen methylation. Because these values are all based on ratios there are no values or units, but they give a general idea of a particular relationship and can tell you how 'turned up' or 'turned down' a particular process is. The middle of the gauge represents an average value, while the lines towards the edge represent results lower or higher than most (80%) of the population. Being outside of any range is not always considered unfavorable. For example, on the estrogen methylation gauge an elevated level means someone methylates estrogens very effectively which may have positive consequences.

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. The glucuronides and sulfates are then broken off of the parent hormones, and the measurement is made. These measurements reflect well 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.