Urinary Hormone Assessment

AN INTRODUCTION

Essence Hormone Tests

The most complete line of endocrine testing

Why Test Hormones in the Urine?

Provides an average of fluctuating hormones

Steroid hormone levels naturally fluctuate over the course of a day. Measurement of hormones in urine collected over several hours provides a stable average of hormone levels that overcomes the "snapshot" limitation inherent in serum and salivary testing.[1]

Evaluates hormone utilization

Steroid hormones that are produced primarily in the adrenal cortex, ovaries and testes are extensively metabolized in various tissues. How they are metabolized influences the ultimate clinical effect of these hormones; this can vary significantly. Measuring their downstream metabolites in the urine can provide us with this critical intracellular information.[2]

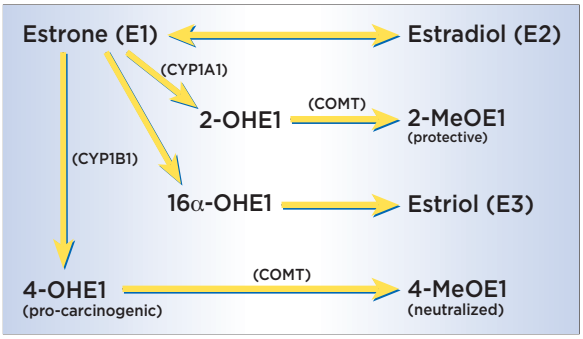
Identifies bioavailable fraction of hormones

The majority of steroid hormones are bound to proteins in the blood that help to maintain these hormones in a non-active 'reserve' form. It is only the tiny, unbound fraction that is available to act upon the body via cellular hormone receptors. The concentration of binding proteins can vary, making it impossible to predict the bioavailable fraction of hormone from a measurement of total (bound and unbound) hormone. All hormones measured in urine represent the unbound, or bioavailable, fraction.

What are some clinical indications for urinary hormone assessment?

Breast & Prostate Cancer Risk Assessment via Estrogen Metabolites

It is not just the amount of total circulating estrogen that impacts breast and prostate cancer risk, but also how that estrogen is processed. Estrogen can be metabolized in healthy, protective directions, or in unhealthy directions that increase cancer risk. Urine testing provides the most comprehensive evaluation of estrogen metabolism possible.



Healthy Phase 1 metabolism:
Production of 2-hydroxyestrone (2-OHE1).

Unhealthy Phase 1 metabolism:
Production of 16α-hydroxyestrone (16α-OHE1) or 4-hydroxyestrone (4-OHE1).

Healthy Phase 2 metabolism:
COMT (methylation enzyme) neutralizes pro-carcinogenic 4-OHE1 and also converts 2-OHE1 to its most protective form.

Imbalances can be easily modified by nutritional interventions.

INTERPRETIVE GUIDELINES

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Hormone Balance and Hormone Replacement Therapy

Bio-identical hormones are fully represented in a urinary hormone evaluation, including their downstream metabolites. Because urinary hormones offer the best reflection of how the body is processing exogenous hormones, steroid measurement in the urine helps ensure that the therapy is having the desired effect.

NOTE: Oral contraceptives and other synthetic hormones, such as medroxyprogesterone acetate (e.g., Provera®) are not reflected on any laboratory assay, including urine. Conjugated equine estrogens (e.g., Premarin®) are only partially represented, although the balance of their estrone metabolites may help shed light on breast cancer risk.

NOTE: Urinary hormones are available as 24-hour collections or First-Morning Void (FMV), which reflects nocturnal levels of hormones. Because of the variability of HRT delivery systems and their pharmacokinetics, it may be easier to obtain a reliable 'average' by using the 24-hour collection rather than a First-Morning Void in HRT-supplemented individuals.

Estrogens (estradiol, estrone, estriol, and estrogen metabolites) in the urine reflect circulating levels as well as tissue metabolism. Serum estradiol is largely represented as estrone glucuronide in the urine. Estrogen metabolism is discussed above.

Progesterone metabolizes into pregnanediol and pregnanetriol. Urine levels of these metabolites correlate with levels of serum progesterone, thus can be used to reliably assess status of the hormone.

Androgens such as DHEA, testosterone, and androstenedione are extensively metabolized into downstream androgen compounds. As a result, the level of Total 17-ketosteroids (DHEA and its metabolites) should be used to assess overall androgen status and/or efficacy of androgen replacement.

Aromatase activity:

The enzyme aromatase converts androgens to estrogens. If aromatase activity is excessive, then administration of testosterone or DHEA will further increase levels of estrogen.

HIGHER aromatase activity is suggested by:

- Lower Total 17-ketosteroids along with higher estrogens

Various interventions can reduce aromatase activity.

5-alpha reductase activity:

The enzyme 5α-reductase converts testosterone to dihydrotestosterone (DHT), a potent androgen associated with male-pattern baldness, acne, hirsutism, polycystic ovarian syndrome, prostate hypertrophy and cancer risk. Alternatively, testosterone can be metabolized to an inactive metabolite by 5α-reductase.

Higher 5α-reductase activity is suggested by:

- Higher androstanediol
- Higher androsterone
- Lower etiocholanolone

Various interventions can reduce 5α-reductase activity.

Adrenal Stress and Anabolic/Catabolic Balance

Stress increases cortisol production, which can be life-saving in the short term. Chronic stress, however, can lead to cortisol-induced immune suppression, hyperglycemia, insulin resistance, central obesity, hypertension, memory impairment, hyperlipidemia, and altered thyroid function. Low cortisol production and/or HPA axis impairment, including low diurnal variation in cortisol secretion, may follow chronic over-activation of the axis by chronic stress, leading to fatigue and other problems.

Greater than 95% of cortisol is metabolized before excretion. Total 17-hydroxy-corticosteroids account for more than 50% of cortisol's metabolic by-products. Consequently, their level in the urine can be used along with cortisol to help gauge overall glucocorticoid production and metabolism, as well as the overall degree of stress ('wear and tear') on the body.

NOTE: Cortisol is not included in the Total 17-OHCS for two reasons: 1) Cortisol and the 17-OHCS are prepared and measured differently; and 2) all research examining 17-OHCS has utilized the GC-MS method only, thus excluding cortisol.

Adrenal insufficiency is suggested by:

- Lower urinary cortisol

  and/or
- Lower Total 17-hydroxy-corticosteroids

Adrenal hyperactivity (or increased clearance and metabolism of cortisol) is suggested by:

- Higher urinary cortisol

  and/or
- Higher Total 17-hydroxy-corticosteroids

NOTE: Urinary cortisol reflects both the production and the excretion of cortisol. The addition of salivary assessment (4 timed cortisol measurements) can help to identify patients with low baseline levels as well as impaired HPA axis function (flattened curve). Alternatively, a morning serum cortisol measurement may be utilized.

Various interventions can help to correct adrenal imbalances.

Anabolic/Catabolic Balance

Persistent catabolic effects of cortisol are most damaging when not balanced by anabolic hormones such as DHEA, important in functions such as immunity, reproduction (via its conversion to downstream sex steroids), cardiovascular health, bone density, and memory.

This anabolic/catabolic balance – or the balance of 'growth and healing' versus 'wear and tear' in the body – can be assessed by comparing total 17-hydroxycorticosteroids with total 17-ketosteroids in the urine.

A low Anabolic/Catabolic balance may be associated with:

- A metabolic shift in which the production of stress hormone is favored over the production of androgens and downstream estrogens
- Aging
- Deficient growth hormone
- Chronic stress or glucocorticoid therapy
- Excessive exercise
- Acute or chronic illness, reduced ability to recover from illness or injury
- Increased risk of developing disease, poorer prognosis in patients with illness

A high Anabolic/Catabolic balance may be associated with:

- Excessive androgen therapy or a metabolic shift in which androgen production is favored over cortisol production
- Possible polycystic ovarian syndrome and/or hirsutism
- Congenital adrenal hyperplasia (enzyme deficiencies)
- Adrenal tumors
- Extreme athleticism

Growth Hormone

Human growth hormone (hGH) from the pituitary promotes healthy aging via its growth-stimulating and healing effects on a variety of systems. After age 20, hGH production progressively declines.

Low levels of hGH have been associated with:

- Decreased muscle mass and exercise tolerance
- Increased visceral fat
- Dyslipidemia
- Diminished ability for growth and repair
- Reduced sense of well-being

The short half-life and pulsatile secretory pattern of hGH prevent reliable assessment of the hormone in the blood. Although serum IGF-1 and binding proteins such as IGFBP-3 may be used to reflect hGH status, the correlation between IGF-1 and hGH may be lost in conditions such as obesity, diabetes, and diseases of the liver and thyroid. For adults, measuring hGH from a 24-hour or FMV urine specimen provides a reliable average of hGH fluctuations. For measurements in children, FMV is recommended.

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