How Is This Test Used?
The BHD #209 and #209E are both used for initial screening and follow up testing for female hormones. These tests can also be used for women who are supplementing with hormones and need to monitor their levels to determine if they are on effective regimens of hormone replacement therapy. This test can be used in premenopausal, perimenopausal and postmenopausal women.

Although this test is called a Female Hormone Profile, it can be used for men to measure sex hormones when there is a suspicion of aromatization of testosterone leading to a higher level of estrogen. This can occur in men who are supplementing with testosterone. High estrogen in men can occur for other reasons and should be evaluated by a physician if levels seem unusually high.

We always recommend as an initial screening test to run the #205 (HPA Stress Profile +5) which includes cortisol diurnal rhythm, DHEA-S, and melatonin along with a estradiol, estriol, progesterone and testosterone, to obtain a broad overview of endocrine output of these hormones. Looking at HPA function in correlation with sex hormones can give us additional insight into how the hormones interrelate in activity and levels. Imbalances in sex hormones can result from HPA axis dysfunction which can is best assessed by measuring Cortisol Awakening Response (CAR) - see the #205-CAR.

What Does This Test Measure?
The #209 offers a single timed measure of estradiol, estriol, progesterone, testosterone and DHEA sulfate. The #209E adds a measurement of estrone. Estrone is the second most potent form of estrogen after estradiol and is produced in adipose tissue by aromatization of adrenal androstenedione. It can also be reversibly produced from estradiol. Estrone is typically higher in menopausal women due to the fact that it does not have to be produced in the ovaries and is made from adrenal hormone precursors. Normal levels of estrone in the menopausal woman demonstrates adequate aromatase activity and healthy metabolism of HRT.

Who Should Do This Test?
- **Premenopausal Women** – For women who would like to measure their hormones on a single day of their cycle as an initial screening test, as a follow up test, or to monitor hormone therapy.
- **Perimenopausal Women** – For women who are noticing changes within their menstrual cycle such as shorter cycles, heavier flow, longer cycles, increased symptoms of PMS or recurring complaints associated with particular days of the menstrual cycle. The #209 can be an initial screening test, a follow up test or can be used to monitor hormone therapy.
- **Postmenopausal Women** – Women in menopause who are experiencing symptoms such as hot flashes, vaginal dryness, fatigue, brain fog, emotional lability, and insomnia will find this test useful to measure baseline hormone levels as well as follow up testing once HRT has been initiated.
- **Men** – Men produce all sex hormones as do women albeit in a different ratio that is dominated by testosterone. This test would be appropriate for men with noted symptoms of testosterone deficiency or imbalance. Signs and symptoms of low testosterone would include loss of muscle mass, gain in body fat, decreased bone density, lipid changes, and loss of body hair.
How is the Test Performed?

Each test kit contains a single tube for a saliva collection. The collection should take place in the morning within an hour of waking. Specific instructions are provided in each test kit and should be read thoroughly before collecting and shipping samples.

- **Premenopausal** - Salivary samples for this test should be collected on days 19, 20 or 21 of a normal menstrual cycle.
- **Perimenopausal** - For a perimenopausal woman still cycling, the salivary samples should be taken on days 19, 20 or 21 of her cycle. If her cycles are becoming consistently shorter, the samples should be collected 5-7 days prior to menses. If the cycles are unpredictable but still frequent, collect salivary samples on day 19, 20 or 21 of the cycle.
- **Postmenopausal** - For women who are in menopause, collect salivary samples on any day.
- **Men** - Collect samples at any time. See recommendations below for men who are supplementing with testosterone.

If using any form of hormone replacement therapy, use should be suspended as follows until saliva collection is complete.

- **Transdermal Creams** - If using topical hormones, it is recommended that they be stopped 48-72 hours prior to saliva collection to avoid contamination of the sample or falsely elevated readings.
- **Sublingual Hormones** - If using sublingual hormones, it is recommended that the hormones be stopped 48-72 hours prior to saliva collection to avoid contamination of the sample or falsely elevated readings.
- **Oral Micronized Progesterone and Other Oral Products** - If taking oral hormones, allow 24 hours to pass from the last dosage before doing saliva collections.
- **Subcutaneous Pellets** - The best collections are taken midway through the life of the hormone product to avoid measurements of transient spikes in hormones when pellets are new.
- **Injectable Hormones** - This primarily applies to injectable testosterone in men. Salivary samples should be taken 10-14 days after the injection giving an opportunity for the hormone to level out.

What Is a Normal Test Result?

Each hormone measured on the #209/#209E has its own reference range and male and female ranges differ. The reference ranges for estradiol and progesterone list a premenopausal range, postmenopausal range and physiological range which is the range to refer to when a patient is supplementing with hormones. The estradiol is further divided by the phases within the cycle (follicular, mid-cycle and luteal) so it is important to know where a woman is in her cycle when the results are evaluated.

We generally recommend that samples be taken mid-luteal phase (days 19, 20 or 21 of the cycle) so that we can assess the progesterone level while it should be peaking in a normal 28-30 day cycle. The premenopausal reference range for progesterone covers the whole cycle (follicular, mid-cycle and luteal phases) and is not separated by different values for the different phases of the cycle. Progesterone should be at the low end of the range in the follicular phase and towards the higher end of the range in the luteal phase.

**Estradiol:**
- **Follicular:** 1.0 – 5.0 pg/mL
- **Mid-Cycle:** 1.0 – 3.0 pg/mL
- **Luteal:** 1.0 – 5.0 pg/mL
- **Postmenopausal:** 0.5 – 3.0 pg/mL
- **Physiological:** 4 – 14 pg/mL
- **Male:** 1.0 – 3.0 pg/mL

**Estriol:**
- **Female:** 2 – 98 pg/mL  
- **Male:** 0.5 – 40 pg/mL

**Estrone:**
- **Male or Female:** 20-50 pg/mL

**Progesterone:**
- **Premenopause:** 50 – 400 pg/mL
- **Postmenopause:** 5.0 – 95 pg/mL
- **Physiological Range:** 100 – 500 pg/mL
- **Male:** 5.0 – 100 pg/mL

**Testosterone:**
- **Female:** 20.0 – 60.0 pg/mL  
- **Male:** 40.0 – 130.0 pg/mL

**DHEA-S:**
- **2.0 – 10 ng/mL (Age/gender specific ranges apply)**

Common Issues Identified Using the #209/#209E

- **Low Progesterone** - If saliva samples are taken in the luteal phase as recommended (days 19, 20 or 21 of the cycle), we can determine if there is a good response to ovulation by the measured output of progesterone. Levels should be above 200 at the peak of the luteal phase in a premenopausal woman. Extremely low progesterone in premenopausal women may be due to thyroid dysfunction leading to reduced fertility. Thorough evaluation of the endocrine system is warranted.

In perimenopause, we see the progesterone response to ovulation decline; ovulation may occur but the output of progesterone is low. Anovulatory (no ovulation) cycles also occur in perimenopause leaving progesterone levels very low in the luteal phase. When a woman is postmenopausal, we refer to the postmenopausal reference ranges if she is not supplementing.

Signs and symptoms of low progesterone include a shortened menstrual cycle, heavy menses, amenorrhea, oligomenorrhea, spotting prior to menses, breast tenderness and swelling, fibrocystic breasts, PMS, endometriosis, anxiety and nervous tension.
High Progesterone – Though less common, this does occur, but it is usually due to over-supplementation. Signs and symptoms of progesterone excess include fatigue, drowsiness, heaviness of the extremities, dizziness, feeling physically unstable and nausea.

High Estrogen/Estrogen Dominance - Estrogen dominance can occur as overall high estrogen levels or normal estrogen levels. Estrogen itself may not be high but relative to progesterone, it is expressing as the dominant hormone. With estrogen dominance, menses may be long and heavy accompanied by cramping and clotting. Women may also experience headaches, water retention, breast tenderness and swelling and internal tension. Estrogen dominance can occur with any of the above progesterone issues. High levels of estrogen may also be due to over-supplementation.

Low Estrogen – Low estrogen output may result in a long menstrual cycle extending beyond 35 days. If there is low estrogen, it may take longer to build up a thick enough endometrium to bleed off. Women who have low estrogen may have an athletic build, low body fat, be thin or underweight and/or exercise excessively. Low estrogen may also be the result of very low DHEA and adrenal dysfunction.

Low Testosterone – This can occur in both men and women but is more commonly seen in men. Even through menopause, most women tend to maintain adequate testosterone levels especially if they have adequate DHEA.

High Testosterone – Elevated testosterone is generally seen in women with advanced PCOS and/or high levels of DHEA. Women with elevated testosterone may be over-supplementing with testosterone or DHEA. High levels of testosterone in men are usually from over-supplementation with testosterone and/or DHEA.

High DHEA-S – Elevated DHEA-S can occur in both men and women. DHEA-S is a good measure of androgen production from the adrenal glands and is frequently elevated in women with PCOS (Polycystic Ovarian Syndrome). If DHEA-S is greatly elevated and the patient is not supplementing, evaluation for adrenal neoplasm is warranted. Other conditions that would lead to a significant increase in DHEA-S are Cushing Syndrome, adrenal hyperplasia or a DHEA-S-producing ovarian or testicular tumor. Symptoms of elevated DHEA-S in women include oily skin, acne and hirsutism. Men are usually asymptomatic with elevated DHEA-S but can become estrogenic due to peripheral conversion.

Low DHEA-S – Low DHEA-S levels are commonly seen in adrenal insufficiency due to HPA axis dysfunction when there has been a down-regulation of the stress response. Over-stimulation of the stress response via chronic stress results in a down-regulation of the system in an effort to protect the body from an excess of cortisol. The pituitary decreases the amount of ACTH (adrenocorticotropic hormone) thereby reducing the stimulation on the adrenal cortex which results in less cortisol and DHEA-S. Symptoms of low DHEA-S include decreased muscle mass, decreased bone density, decreased libido, depression, joint pain and lowered immunity.

Additional Testing Recommendations

It is always recommended to do a #201, #205 or #204 Adrenal Stress Index with any hormone testing. The issues that are revealed on the #209/#209E may related to adrenal insufficiency as a result of dysfunction within the HPA axis. Evaluating a patient for HPA axis dysfunction is best achieved through a Cortisol Awakening Response (CAR) salivary test. Low estrogen and testosterone may result from low DHEA. It is also important to evaluate the thyroid with a complete thyroid panel that includes TSH, Free T3, Free T4, Reverse T3 and thyroid antibodies.

Treatment Recommendations

Where the end result presents as a deficiency of progesterone, the following recommendations would be appropriate.

Bio-Identical Progesterone - Treatment may consist of the use of bio-identical progesterone in the luteal phase starting on day 15 of the cycle through day 27 (or the day before menses if the cycle is longer). There are several options in using bio-identical progesterone from compounded formulas to over-the-counter products. There are also several delivery systems which include sub-lingual, trans-dermal, trans-vaginal, oral micronized and trans-buccal. Dosing schedules can be static (same dosage everyday) or cyclical (dosage varies to mimic natural progesterone output).

Botanical Support – Botanicals have been used extensively with great success in supporting a healthy menstrual cycle. Herbs such as Chaste Tree, Wild Yam, Black Cohosh, Blue Cohosh and Dong Quai all have a regulating effect on the menstrual cycle. There are numerous formulas available to address issues related to low progesterone.

Nutritional Support – Diet and lifestyle play a significant role in the health of the menstrual cycle and hormonal balance overall. A healthy, whole foods diet low in sugar along with regular exercise and sufficient sleep all contribute to a healthy and balanced hormonal state. If low progesterone is related to PCOS, address glucose management and reduce fasting insulin levels with a selective carbohydrate/moderate protein/healthy fats diet.

Support the Adrenals – Check the adrenals and support adequately with an appropriate program. It is also important to assess the patient from a Functional Medicine perspective to reveal underlying stressors that may be contributing to a state of imbalance.

Elevated Progesterone

Usually due to over-supplementation or use of progesterone product too close to testing. Evaluate the dosage, duration of use and mode of delivery of progesterone supplementation. Greatly elevated saliva levels are commonly seen when transdermal progesterone has been used daily for several years.
Elevated Testosterone – Men
- Elevated testosterone in men is usually due to supplementation. Evaluate dosage, frequency and duration of use.

Low Testosterone – Women
- Assess HPA Function including DHEA-S Levels – Low testosterone in women can be due to adrenal dysfunction and low DHEA-S. Treat HPA dysfunction appropriately.
- DHEA Supplementation – Supplementing with DHEA when appropriate, can raise testosterone. Women can be very sensitive to the androgenizing effects of DHEA therefore starting dosages should be low at 1-5 mg twice daily of a sublingual product.
- Testosterone Replacement Therapy – Testosterone transdermal creams are available for women. Maximum dosage is 1mg applied topically per day. It is very easy for women's testosterone levels to go too high when supplementing therefore dosing every other day or even two days a week may be enough to keep levels normal. Subcutaneous testosterone pellets are also available. Testosterone is a pharmaceutical and is only available through a licensed physician.

Low Testosterone – Men
- Assess HPA Function including DHEA-S Levels – Low testosterone in men can be due to adrenal dysfunction and low DHEA-S. Treat adrenal dysfunction appropriately.
- Andropause – Men go through hormonal changes as they age, however, declining testosterone levels tend to occur gradually in the fifth decade of life without a distinct event to mark the beginning of andropause. Testosterone declines and aromatase activity increases converting testosterone to estrogen resulting in an overall decline in free testosterone.
- DHEA Supplementation – Men can tolerate higher dosages of DHEA than women. A good rule is to start low and work up to a higher dosage.
- Testosterone Replacement Therapy – Testosterone replacement therapy can be done as a transdermal cream or gel or through injections and can only be prescribed by a licensed physician.

High DHEA-S
- Further Evaluation – In women, evaluated for PCOS. If levels are very high, in both men and women, evaluate for adrenal hyperplasia, adrenal neoplasm, Cushing's and DHEA-S producing ovarian or testicular tumor.
- Over-Supplementation – This is usually the most common cause of elevated DHEA-S. Reduce dosage or discontinue supplementation.

Elevated Testosterone – Women

- Dietary Recommendations - Avoid excessive dietary soy-based products and hormone-laden meats and dairy. Include lots of veggies and high fiber foods to keep bowels moving and facilitate estrogen clearance. Foods such as ground flax seeds and cruciferous vegetable are also help reduce excess estrogen.
- Liver and Bowel Detoxification - Support clearance of estrogens and healthy estrogen metabolism through liver detox and healthy bowel elimination via targeted detoxification programs. Estrogen passes through the liver where it is conjugated and deactivated then excreted into the bowel for elimination via the stool. If bowels are sluggish, estrogen can reactivate and get reabsorbed. Estrogen dominance can result from lack of healthy estrogen clearance.
- Nutritional Support - Products such as DIM and Calcium-D-Glucarate help with clearance of excess estrogen.

Low Estrogen

- Further Evaluation - Measure pituitary hormones FSH and LH to evaluate for menopause. Also, evaluate the adrenals and perform a complete thyroid panel as listed above. Support low DHEA with supplementation. Consider bio-identical estrogen supplementation if needed.
- Botanical Support – Herbal formulas containing Black Cohosh, Hops, Red Clover, Licorice, Dong Quai, Damiana and soy can be helpful with symptoms associated with low estrogen.
- Low Body Weight - If underweight or very athletic, patient may need to put on some weight and improve nutrition. If patient is over-exercising, they may need to modify their training schedule.

Elevated Testosterone - Women

- Further Evaluation - Evaluate for PCOS and related symptoms of acne, hirsutism and irregular cycles. Measure pituitary hormones FSH and LH to assess ovulation. Measure prolactin, SHBG (sex hormone binding globulin), and fasting insulin.
- Dietary Support – If elevated testosterone is associated with PCOS, reduce carbohydrates, moderate protein and healthy fats. Liver and bowel support for detoxification to promote clearance of testosterone. Glucose management is very important with PCOS so keeping carbohydrates low and regular exercise are necessary.
- Botanical/Supplement Support – Herbal formulas containing chaste tree berry, licorice, white peony, gymnema, schisandra and dong quai. Nutritional supplements to help with glucose management and insulin sensitivity include d-pinitol, myo-inositol, cinnamon, berberine and chromium.
Low DHEA-S

- **Further Assessment** – Evaluate cortisol and DHEA-S.
- **Supplementation** – DHEA can be supplemented in both men and women, however, the dosages for women need to be much lower than the dosage for men. Starting dosage for women: 1-5 mg twice daily. Starting dosage for men: 5-10 mg twice daily.

**Follow Up Testing**

Retest in 2-3 months after initiating therapy. Use of hormones during testing may skew the results. Whether or not your patient should discontinue hormone supplementation depends on the goals of the therapy. If a woman is peri-menopausal and you are evaluating the effect of long term hormone therapy, keep her on the hormones until three days prior to testing to reduce overly elevated test results due to contamination of the sample.