

# Estrogen Metabolism Assessment (Serum)

Great Smokies Diagnostic Laboratory<sup>SM</sup>

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Patient: **SAMPLE PATIENT**

Age: 35  
Sex: F  
MRN:

Order Number:

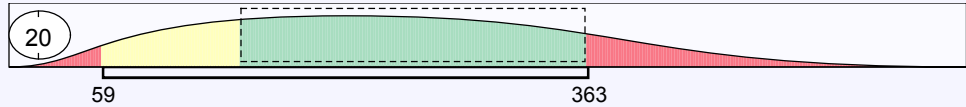
Completed:  
Received:  
Collected:

## SAMPLE REPORT

### Estrogen Metabolism

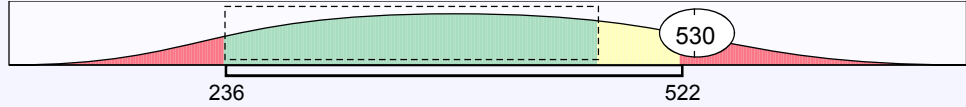
**2-Hydroxyestrone**

Ref Range  
pg/mL



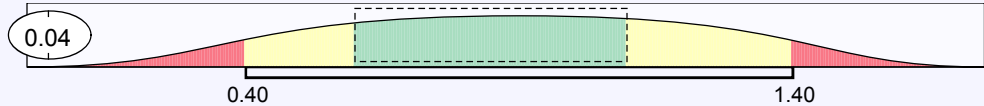
**16-alpha-Hydroxyestrone**

Ref Range  
pg/mL



**2:16-alpha-Hydroxyestrone Ratio**

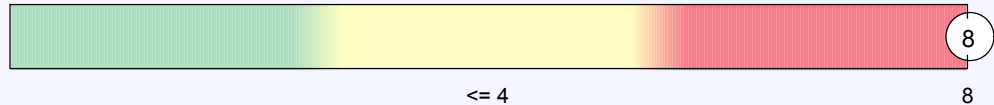
Ref Range



### Estrogen Metabolism Index

**Estrogen Metabolism Index**

Ref Range



### Commentary

#### Estrogen Metabolism Assessment (Premenopausal Patient)

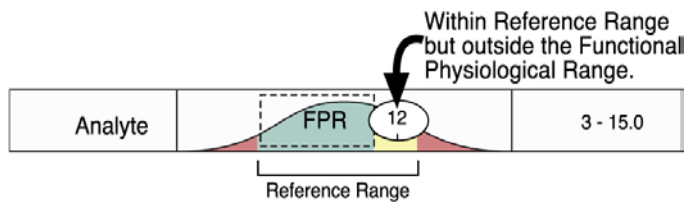
All reference ranges and functional physiologic ranges for this profile were determined with luteal serum samples from women in their reproductive years.

The **Reference Range** is a statistical interval based upon those values between the 2.5th percentile and the 97.5th percentile of the reference population.

The **Functional Physiological Range (FPR)**, represented by the dotted box within the reference range, depicts an optimal target interval. Values within the reference range but outside the **FPR** are not necessarily abnormal. Rather the **FPR** has been established by the Department of Medical Science, based upon current medical literature, scientific analysis of reference range study data points and clinical experience. **(See example of FPR below)**

Histograms represent idealized data based upon large populations

## Commentary



\*note ref range is marked by the red color transition on histogram

### Estrogen Metabolism

**2-Hydroxyestrone (2-OHE1)** levels were below the expected range. As this metabolite represents a beneficial direction in estrogen metabolism, low levels are viewed as suboptimal for most conditions, although some literature suggests this may be of benefit in relation to osteoporosis, at least in Asian populations. Metabolic shifting away from the 2-OHE1 pathway may occur with exposure to pesticides. Low levels of this beneficial metabolite may be due to genetic/racial factors, poor exercise habits, obesity, and dietary influences such as imbalanced fatty acids and a low intake of cruciferous vegetables and lignans. Monitoring of 2-OHE1 may be of particular importance when initiating any hormone treatment (such as contraceptives or estrogen replacement therapies) as there appears to be benefits if the 2-OHE1 level and 2:16alpha-hydroxyestrone ratio increases appropriately with increased estrogen exposure.

**16alpha-Hydroxyestrone (16alpha-OHE1)** is above the reference range. This finding represents a non-beneficial shift in estrogen metabolism. This metabolite may be associated with a number of problems, including lupus, breast cancer and other estrogen-dependent diseases. Paradoxically there may be some protective association between this metabolite and osteoporosis, at least in non-obese, Asian women. There are genetic/racial, dietary and exposure factors that may relate to an elevated 16alpha-OHE1 level. Obesity may contribute to high levels. In vitro cellular studies also suggest that pesticide exposure may lead to increased levels. Fortunately, there are a number of strategies that appear to minimize the influence of the 16alpha-OHE1 level: increased intake of cruciferous vegetables, normalizing body weight, exercise, omega 3 fatty acids, and flaxseed lignans. All of the latter factors act to increase production of 2-hydroxyestrone and raise the 2:16alpha-hydroxyestrone ratio.

The **2:16alpha-Hydroxyestrone ratio** appears from the literature to be an important gauge of estrogen metabolism. In general, the higher the ratio, the less association there is with estrogen-dependent diseases such as breast cancer and lupus, and the more likely the person has a beneficial hormone metabolism. A 2:16alpha-hydroxyestrone ratio in serum greater than 0.4 is generally thought to be beneficial. There are numerous modifiers of this value, most of which induce changes in the level of 2-OHE1. These include intake of indole-3-carbinols from cruciferous vegetables, flaxseed, soy, omega-3 fatty acids, and vigorous exercise. All are shown to improve the levels of 2-OHE1 in most individuals. It is to be emphasized that some individuals in clinical studies have exhibited a paradoxical response to treatments that would typically raise the 2-OHE1 levels. Therefore, follow-up testing after treatment is strongly suggested.

There may be an increased likelihood of osteoporosis with excessive 2-OHE1 production. It is important to note that the ideal upper limit of 2-OHE1 is not apparent from the existing literature. Attention to bone loss processes in the urine is perhaps warranted in individuals with a very high 2:16alpha-hydroxyestrone ratio.

### Estrogen Metabolism Index

### *Commentary*

The **Estrogen Metabolism Index** was developed by the Department of Medical Science and is based upon current scientific literature and consensus medical opinion. This index assigns a numeric value to the combined results of the 2-OHE1, 16alpha-OHE1 and the 2:16alpha-OHE1 ratio. We provide this value to assist the practitioner and patient in evaluating response to lifestyle, nutritional and therapeutic regimens that may modify estrogen metabolism.

One or more of the values for 2-OHE1, 16alpha-OHE1, and the 2:16alpha-OHE1 ratio fall outside of the reference range, indicating that estrogen metabolism is shifted in a non-beneficial direction. This represents a situation whereby adjustments to health, lifestyle, and supplement regimens would be expected to benefit the individual. Adjustments made to lower the Estrogen Metabolism Index may decrease the likelihood of estrogen-dependent conditions such as lupus, breast cancer and osteoporosis. Monitoring of these analytes and the ratio is suggested if significant changes to health and lifestyle factors occur or if there is a change to or addition of hormone-modifying therapies.