

Physiology of Menopause

Menopause Defined

- Menopause is the cessation of the monthly hormone cycle and fertility in women
 - See “Hormones in the Cycling Female” for a complete review of premenopause
- Menopause is a natural transition away from fertility
- For most women, menopause symptoms are mild
 - Long-term health concerns may still develop with mild menopause symptoms
- For some, menopause comes with severe symptoms and significant changes in overall health
- Support includes lifestyle changes that meet the body’s changing needs, supplements and medications, and hormone replacement therapy

Postmenopausal Estrogen

- Ovarian estrogen and progesterone production stops after menopause
- The **ovaries** continue to produce **androgens**, mostly releasing testosterone
- The **adrenal glands** continue releasing **DHEA**
- Circulating testosterone and DHEA are aromatized into a small amount of estrone and estradiol in the peripheral tissue, mostly adipose
- **Androgen aromatization is the main source of estrogen after menopause**

Benefits of Estrogens

- Growth- estrogen is critical for bone density, muscle mass, and collagen synthesis
- Libido
- Insulin sensitivity
- Support neurotransmitter balance & mood
- Weight management
- Sleep
- Memory & concentration
- Hair & skin health
- Cardiovascular health

Perimenopause and Menopause

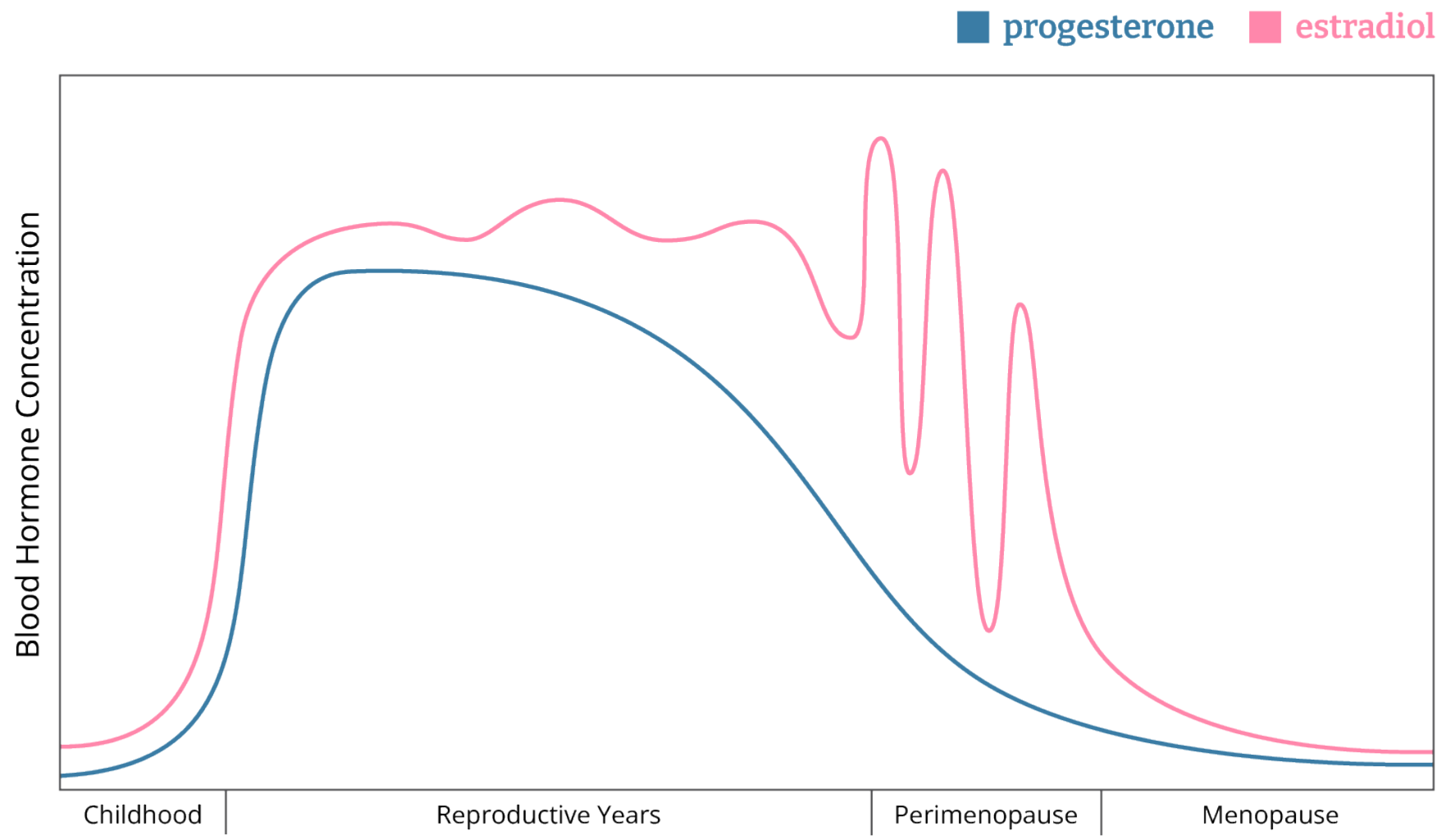
Perimenopause:

- Leading up to menopause
 - Irregular cycles
 - Low progesterone (P)/random or absent ovulation
 - High estrogen (E) some days, low E other days

Menopause

- Cycles stop completely
 - Diagnosed after 12 contiguous months without a cycle
 - Low P and E every day
 - Systems supported by E and P begin to decline (details later in presentation)

Perimenopause to Menopause



HPO Axis in Perimenopause and Menopause

- Ovarian reserve (ova available for maturation) declines with age
- FSH signal to the ovaries to recruit ova is less and less successful as ovarian reserve declines
- FSH has no negative feedback from E2
 - No E2 because there is no ova maturation/E2 production
- **FSH increases**, sometimes high enough or long enough to be successful, resulting in **irregular cycles and high E2**
- Immature, aging, damaged ova less likely to ovulate or excrete P
- **Lower P, E2 dominance, irregular cycles**
- **Eventually no cycles for 365 days = Menopause**
 - High LH, FSH
 - Low E2 and P

Serum Hormones Pre- and Post-menopause

• Premenopause Hormones

- Estradiol 30-400 pg/ml
- Progesterone 2-25 ng/mL
- LH 5-25 IU/L
- FSH 4.7-21.5 mIU/mL

• Postmenopause Hormones

- ↓ Estradiol 0-30 pg/mL
 - Males are higher at 10-50 pg/mL!
- ↓ Progesterone <1 ng/mL
- ↑ LH 14.2-52.3 IU/L
- ↑ FSH 25.8-134.8 IU/L

- **Premenopause Luteal Hormones**

- Estradiol 1.8-4.5 ng/mg
- α -Pregnanediol 200-740 ng/mg
- B- Pregnanediol 600-2000 ng/mg

- **Postmenopause Hormones**

- ↓ Estradiol 0.2-0.7 ng/mg
 - Males are higher at 0.5 – 2.2 ng/mg!
- ↓ α -Pregnanediol 15-50 ng/mg
- ↓ B- Pregnanediol 60-200 ng/mg

Key Hormone Changes With Menopause

- Menopause
 - Very low E and P
 - Very little E activity in the body
 - Systems that benefit from E show decline
 - Bones, cardiovascular system, metabolism, musculoskeletal system...and more
- LH and FSH show a sharp increase
 - These signals are *suppressed* by E and P
 - Ovarian E and P production stop
 - LH and FSH increase when E and P are low
- Androgens show minimal change
 - Some women enter menopause with low androgens
 - Androgens are an important target for postmenopausal support

Diagnosis:

- History:
 - Age: 45-55 years
 - Menses absent for contiguous 12 months
- Labs (not required):
 - High LH and FSH with the above history indicate ovarian cessation/menopause
- Menopause is not diagnosed by measuring estradiol or progesterone

Low Estrogen: Signs & Symptoms

- Hot flashes
- Insomnia
- Low sex drive
- Mood changes
- Brain fog
- Vaginal dryness & absence of fertile cervical mucous
- Joint pain
- Decreased bone mineral density

Menopause Symptoms

- Perimenopause: Irregular periods/fluctuating symptoms
 - Mood swings
 - Weight gain
 - Intermittent hot flashes/night sweats
 - Estrogen dominance interspersed with low estrogen
- During **menopause**, E & P are low all the time
- Low estrogen symptoms:
 - Hot flashes (76.1%)
 - Insomnia, disrupted sleep (65.7%)
 - Low libido/Vaginal dryness (58.9%/55.8%)
 - Depression/Irritability/Anxiety (46.2%/45.1%/30.5%)

Menopause Long Term

- Bone loss: A concern for all aging adults, menopause speeds up bone loss in women due to low estradiol (E2). E2 helps maintain bone density throughout a woman's (and man's) life.
- Metabolic Disease: E2 helps with insulin sensitivity and weight management, lowers cholesterol, and helps maintain normal blood pressure. Women are at higher risk of developing metabolic disease post menopause.
- Cardiovascular health declines with menopause.
- Additional concerns: chronic insomnia, anxiety, loss of muscle mass, decline in sexual function

Conclusion

- Menopause is the cessation of the menstrual cycle, typically between ages 45-55
- It results in a dramatic decline in estrogen and progesterone
- These hormone changes result in a decline in estrogen-related function
- Many women have symptomatic menopause, most commonly hot flashes, night sweats, insomnia, low libido, vaginal dryness, depression, and mood swings
- Diagnosis is based on history
- Treatment & clinical concerns in next menopause presentation!

Thank You!

If you are interested in learning more about hormones, each week we hold one-hour long mentorship sessions! Once you are a registered DUTCH provider, you can book these through our online scheduling link. Please call to get registered today.

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