

# Suitable Balance of Estrogen Keeps Good Health

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## Abstract:

Estrogens, the class of female steroid hormone are responsible for making a woman a woman. Imbalance of this hormone sometimes plays havoc in person's life. Imbalance of this hormone may be due to pathophysiological and/or environmental by getting exposed with xenohormones [1] which are omnipresent in air, water, and soil [food] now days, serious cause of ill-health. Unusual levels of estrogens in the circulatory system influence many organs and systems, cause certain systemic diseases and disorders

**Keywords:** xenohormones; reproductive years; menopause; fluctuating estrogen levels

## Introduction

Chemically estrogens are steroids produced from the precursor cholesterol. The type of steroid formed is dependent upon attachment of hydroxyl groups [OH]. The three majors naturally occurring estrogens in women are:

- Estrone (E1): This is the primary type of estrogen in menopausal females and normal males. The ovaries, placenta, testicles, and fat tissue produce estrone from androgens.

- Estradiol (E2): This is the most potent form of estrogen, and its concentration is highest in females of childbearing age.

- Estril (E3): The placenta produces this type of estrogen, which reaches peak levels during pregnancy. The amount of estril increases as the foetus grows. (2).

Estradiol (E2) is the primary form of estrogen in the body during child bearing age (2) both in terms of absolute serum levels as well as in terms of estrogenic activity.

Many systems in the body are in part governed by estrogen. The hormone regulates the menstrual cycle, libido, and vaginal functioning, such as lubrication and elasticity. It helps in maintaining strong bones and prevents cardiovascular disease. It also contributes to the health of the urinary tract, breasts, muscles, and skin [2,3].

Estrogens, whether natural or synthetic, have a wide range of clinical uses in the human female [4,5] In prepubertal females, estrogens are used in treating gonadal dysgenesis, excessive height, and genital infections. During the reproductive years, estrogens are used in managing

- 1] menstrual disorders [amenorrhea, menorrhagia, dysmenorrhea];
- 2] infertility [poor cervical mucus and anovulation];
- 3] pregnancy [abortion, lactation suppression];
- 4] dermatological disorders [acne vulgaris, hirsutism];

- 5] combined estrogen/progestogen usage for contraception; and

- 6] postcoital contraception.

During the postmenopausal years, estrogens are used in treating menopausal syndrome and breast cancer as well as various genital problems [infection, atrophic vaginitis, genital prolapse]. In the human male, estrogens are used in treating prostatic carcinoma and sexual problems. Estrogen therapy should be used with caution, and benefits should be weighed against the hazards. Possible side effects and alternative forms of treatment should be considered [6,7].

## Fluctuations of Estrogen Levels

During a woman's lifetime, estrogen levels will often fluctuate, rising during puberty and remaining at healthy levels until her 40s and 50s, or the beginning of menopause [8] At this point, estrogen production significantly drops, signaling the end of natural fertility and impacting the brain in ways that may be associated with mood changes, anxiety, depression, memory loss, and diminished neuroprotection.

Menopause, and its associated drop in estrogen production, can inflict sudden and sometimes severe health problems on women. Research shows that infusions of estrogen can treat depression and other challenges that sometimes accompany menopause. But not all menopause treatments are created equal, and it's crucial to be able to explore and identify effective treatments [9].

## High levels

This imbalance can occasionally lead to mood swings, anxiety, headaches, insomnia, memory problems, bloating, swelling, and low sex drive, which may lead women to shift their treatment [10]

## Low levels

In the years leading up to menopause, the body begins to produce less estrogen. This can lead to a range of symptoms experienced in perimenopause such as hot flashes, night sweats, lower sex drive, vaginal dryness, osteoporosis, insomnia, mood swings or depression, and impairments to memory and concentration [10,11].

### **Affects Body Systems**

Primarily estrogens are responsible for the growth and development of female sexual characteristics, regulation of the menstrual cycle, and management of the reproductive system. Nevertheless, lately it was found that in addition to male and female reproductive behaviour, levels of estrogens also influence other systems.

#### **a. The Skin**

Estrogen prevents a decrease in skin collagen and elastin, so it helps maintain skin thickness and elasticity." It also helps keep skin moisturized, which is why post-menopausal skin is typically drier than it was before. "Estrogen increases dermal matrix proteins, like mucopolysaccharides and hyaluronic acid," [12]

#### **b. Accelerated Bone Loss**

Recently it was reported that Osteoblasts, osteocytes, and osteoclasts all express estrogen receptors. [13] The estrogen-replete state may enhance osteoclast apoptosis via increased production of transforming growth factor [TGF]-beta. Estrogen deficiency increases while estrogen treatment decreases the rate of bone remodeling and the amount of bone loss during the remodeling cycle [14]. Estrogen deficiency affects both man and woman equally. The bone loss is due to excessive bone resorption accompanied by inadequate bone formation. Estrogen deficiency increases the number of osteoclasts and decreases the number of osteoblasts resulting in overall bone resorption. Fracture risk in postmenopausal women inverse in proportion to the estrogen level. [15]

#### **c. Regulate Eyes Too**

Women's hormones fluctuate frequently. Menstrual cycles, puberty, pregnancies, aging, birth control pills, perimenopause, and menopause all significantly change estrogen levels, and eyesight fluctuates right along with those shifts in hormone levels [16]. When the estrogen level declines, so does the lubrication produced by the oil glands in the eyes. This causes dryness and sometimes blurry vision [17]. Extremely high levels of estrogen can have the same effect. A pregnant woman may experience temporarily blurry vision. Estrogen can cause the cornea to become more elastic and can change the way light travels through the eye. [18] Both of these changes can lead to blurry vision and difficulty in wearing contact lenses. Increasing evidence suggests that lifetime exposure to estrogen may alter the pathogenesis of glaucoma. Estrogen exposure may have a neuroprotective effect on the progression of primary open-angle glaucoma [19]

#### **d. The brain**

Estrogen also enhances communication between neurons in the hippocampus, an area of the brain that is important for verbal memory. Receptors for estrogen molecules are found in cells throughout women's brains, the sex hormone generally have a nourishing and protecting role in the central nervous system

The hormone also protects emotional well-being—when estrogen plummets in menopause, anxiety and depression often result. It offers neuroprotective qualities helping the brain heal after a stroke or traumatic brain injury and guarding against degeneration that can lead to cognitive decline and dementia. Estrogen imbalances are thought to play a role in several brain disorders, including Alzheimer's disease, stroke, and autoimmune disorders. New drugs to target the hypothalamus might someday be the key to treatment.

Sleep is also a physiological function of the brain but regulated by different conditions. We have shown earlier that there is an inverse relationship

between estrogen and the hormone melatonin which aids sleep [20]. Because of this menstruating and menopausal woman will have sleep disorders [21].

#### **e. Immunity**

Estrogen influences our immunity by stimulating the production of immune-boosting cytokines which can protect us against certain autoimmune diseases, and curb the expression Caspase-12, an enzyme that hinders the body's defense system against bacteria and viruses. There is plenty of research showing that inflammation can increase during menopause due to declining estrogen. Estrogen is anti-inflammatory, so it makes sense that as it decreases, inflammation increases. This change can occur during any stage of menopause. Estrogen influences our immunity by stimulating the production of immune-boosting cytokines which can protect us against certain autoimmune diseases, and curb the expression Caspase-12, an enzyme that hinders the body's defense system against bacteria and viruses. [22, 23].

#### **f. The Heart and circulatory System**

Physiologically, estrogen regulates cholesterol levels [24]. The human body needs a suitable balance of estrogen and other sex hormones for good health and sexual development. Disproportion of estrogen in the human body increases risk of blood clots, which can cause a stroke, a heart attack, and even death.

When estrogen levels decline, levels of LDL cholesterol increase, and levels of HDL cholesterol decrease, leading to the buildup of fat and cholesterol in the arteries that contributes to heart attack and stroke. Estrogen's protective effect on the cardiovascular system is reduced because of low estrogen levels. This may also cause heart and blood vessels to become stiffer and less elastic [25] Because of this the blood pressure increases, which can damage blood vessels and increase the risk for stroke, heart disease, and heart failure. [25].

Estrogen has direct and indirect effects on the cardiovascular system that are mediated by the estrogen receptors ER-alpha and ER-beta [26]. The direct effects of estrogen occur through rapid nongenomic and longer-term genomic pathways by activating of endothelial nitric oxide synthase, leading to arterial vasodilation. Longer-term effects involve changes in gene and protein expression, modulating the response to injury and atherosclerosis. Estrogen also indirectly influences serum lipoprotein and triglyceride profiles, and the expression of coagulant and fibrinolytic proteins. Advanced atherosclerosis and certain progestins, however, may attenuate some of the protective effects of estrogen. Women with premature menopause should be aware that they may be more likely to develop heart failure or atrial fibrillation than their peers,

When estrogen levels fall during perimenopause, the lack of estrogen makes women more susceptible to circulatory problems. Poor blood circulation is one of the main causes of leg pain. Poor circulation can contribute to more severe problems, such as severe leg swelling, varicose veins and restless leg syndrome. Estrogen Levels Tied to Risk for Sudden Cardiac Death [27].

#### **g. Cause of Cancers**

Estrogen plays a role in causing certain cancers and acts like a carcinogen [28]; it increased risk of certain cancers, specifically breast, uterine and vaginal cancers. They rely on estrogen to develop and grow. [29]. People who use estrogen hormone therapy for menopause symptoms may be more prone to estrogen-dependent cancers, Estrogen-related risk may go up with them: Estrogen replacement therapy eases menopausal symptoms like hot flashes, night sweats and vaginal dryness. But taking estrogen alone increases the risk of uterine cancer. Combination hormone therapy [estrogen and progesterone] is less likely to cause uterine cancer [30].

Tamoxifen is a breast cancer drug that lowers the risk of breast cancer and its recurrence. It's a selective estrogen receptor modulator [SERM] that blocks estrogen's effects on breast tissue. But in menopausal women, tamoxifen acts like estrogen in the uterus [31]. It stimulates the growth of the uterine lining, thus increasing endometrial cancer risk. Still, the chances of

developing endometrial cancer from tamoxifen are less than 1% per year. There's also a slightly higher risk of uterine sarcoma, a cancer that forms in uterine muscles or tissues.

### h. Regulating Microbiota

The gut microbiome regulates the level of circulating estrogen via enterohepatic circulation. As well, estrogens regulate the gut-skin axis by increasing gut microbiome diversity to insure the uptake of bile-excreted estrogen from the gut [32-34].

### h. other health conditions

Some health conditions have an association with or lead to estrogen dominance. These include polycystic ovary syndrome [PCOS] [35], uterine fibroids [36], endometriosis, and Insulin resistance also affected by increased estrogen levels. Posit role of estrogen in female's v/s males were established during recent pandemic of corona virus. These differences raised possible therapeutic and protective actions of 17 $\beta$ -estradiol against COVID-19 [37,38].

### References

- Mackey R, and Eden J [1998]. Phytoestrogens. *Climatic* 1[4]:302-308.
- Pamplona SMT, et al. [2018]. Estrogenic Compounds: Chemical Characteristics, Detection Methods, Biological and Environmental Effects. *Water Air Soil Pollut* 229 [144].
- Gupta PD and Pushkala K [2005]. Hormones. In: Shrivastva LM, Editors. *Concepts of Biochemistry for Medical students*. New Delhi [India]: CBS Publishers & Distributors;
- Gupta PD, et al. [2000]. *Mothering A Cause: Practical Knowledge of Reproduction and Motherhood*. Oxford & IBH Publishing Co Pvt Ltd NewDelhi.
- Gupta PD [2020]. Natural and Synthetic Estrogens Regulate Human Health. *J Chem Appl* 2: 21-24.
- Harrison RF and Bonnar J. [1980]. Clinical uses of estrogens. *Pharmacol Ther.*;11[2]:451-467.
- Hoyt LT, and Falconi AM. [2015]. Puberty and perimenopause: reproductive transitions and their implications for women's health. *Soc Sci Med*. 132:103-12.
- Gupta PD. [2020]. Menstrual Cycle and its Importance. *Arch Reprod Med Sex Health.*; 3: 51-54.
- Gupta PD. [2020]. Hormone Imbalance: The Serious Health Hazard for Woman. *J Gynecol Obstetr.*;3[1]:03-08.
- Delgado BJ, Lopez-Ojeda W. Estrogen. [2023]. J [Updated 2022 Jun 28]. In: StatPearls [Internet]. Treasure Island [FL]: StatPearls Publishing;
- Robinson D, et al. [2013]. The effect of hormones on the lower urinary tract. *Menopause Int.*;19[4]:155-162
- Grymowicz M, et al. [2020]. Hormonal Effects on Hair Follicles. *Int J Mol Sci* 21[15]: 5342.
- Khalid AB and Krum SA. [2016]. Estrogen receptors alpha and beta in bone. *Bone*. 87:130-135.
- Emmanuelle Noirrit-Esclassan, et al. [2021], Critical Role of Estrogens on Bone Homeostasis in Both Male and Female: From Physiology to Medical Implications. *Int. J. Mol. Sci.* 22[4], 1568;
- Gupta P. D. and Sood, P. P. [2022]. Osteoporosis: A Gender Based Analysis, *Jour Cell Tissue Res* 22[1]: 7183-7186
- Gupta PD, et al. [2005]. Sex hormone receptors in the human. eye. *Surv ophthalmol.*;50[3]:274-84.
- Spoerl E, et al. [2007]. Oestrogen-induced changes in biomechanics in the cornea as a possible reason for keratectasia. *Br J Ophthalmol*. 91[11]:1547-50
- Gupta PD [2020]. Hormonal Regulation of the Dry Eye. *JSM Ophthalmol* 7[1]: 1069.
- Dewundara SS, Et Al. [2016]. Is Estrogen a Therapeutic Target for Glaucoma? *Semin Ophthalmol.*;31[1-2]:140-146.
- Jagota A, et al. [1999]. Pineal rhythms are synchronized to light-dark cycles in congenitally ano-phthalmic mutant rats. *Brain Res* 825[1-2] :95-103
- Lee J, et al. [2019]. Sleep Disordersand Menopause. *J Menopausal Med* 25[2]: 83-87.
- Harding AT and Heaton NS. 2022 The Impact of Estrogens and Their Receptors on Immunity and Inflammation during Infection. *Cancers [Basel]*.14[4]:909\
- Khan N.J. [2020]. *Allergy Infect Dis*1[2]:38-48.
- Barton M [2013]. Cholesterol and atherosclerosis: modulation by oestrogen. *Curr Opin Lipidol*. 24[3]:214-20
- Colditz GA et al. [1987], Menopause and the risk of coronary heart disease in women. *N Engl J Med.*; 316:1105-1110.
- Knowlton AA and, Lee AR [2012]. Estrogen and the cardiovascular system. *Pharmacol Ther.*;135[1]:54-70.
- [2014]. Cedars-Sinai Medical Center. "Sex hormone levels in blood linked to risk of sudden cardiac arrest." *ScienceDaily*.
- Gupta P D. [2021]. "Potential Cause of Cancer Breast Cancer: Xenoestrogens", *J Oncology and Cancer Screening*, 3 [4];
- Gupta PD, and Pushkala K. [2006]. Age dependent changes in steroid hormoneslevel modulate progression and regression of breast cancer. *J Cell Tis-sueRes*. 6[2]: 825-836.
- Gupta P D. [2021]. "Disturbed Steroid Hormonal Milieu is a Potential Cause of Cancer". *Acta Scientific Medical Sciences* 5.4: 19-22
- Lorizio W, et al. [2012]. Clinical and biomarker predictors of side effects from tamoxifen. *Breast Cancer Res Treat*. 132[3]:1107-1118
- Sawicka B, et al. [2017]. Imbalance of Gut Microbiota. Induces Cancer. *J Cell Tissue Res*. 17[2]: 6073-6084
- He S, et al. [2021]. The Gut Microbiome and Sex Hormone-Related Diseases. *Front Microbiol.*;12:711137.
- Lephart ED and Naftolin F. [2022]. Estrogen Action and Gut Microbiome Metabolism in Dermal Health. *Dermatol Ther [Heidelb]*.;12[7]:1535-1550
- Dennett CC and Simon J. [2015]. The role of polycystic ovary syndrome in reproductive and metabolic health: overview and approaches for treatment. *Diabetes Spectr*. 28[2]:116-120.
- Robinson Det al. [2013]. The effect of hormones on the lower urinary tract. *Menopause Int*19[4]: 155-162
- Khan N. [2020]. Possible protective role of 17 $\beta$ -estradiol against COVID-19. *J Allergy Infect Dis*1[2]:38-48.
- Gupta P D [2022]. *Corona Gyan*. Capricorn Publishing, House, Jaipur, India.

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