

Estraderm[®]
(estradiol transdermal system)

Continuous delivery for twice-weekly application

Rx only

Prescribing Information

ESTROGENS INCREASE THE RISK OF ENDOMETRIAL CANCER.

Close clinical surveillance of all women taking estrogens is important. Adequate diagnostic measures, including endometrial sampling when indicated, should be undertaken to rule out malignancy in all cases of undiagnosed persistent or recurring abnormal vaginal bleeding. There is no evidence that the use of “natural” estrogens results in a different endometrial risk profile than synthetic estrogens at equivalent estrogen doses. (See WARNINGS, Malignant Neoplasms, *Endometrial Cancer*.)

CARDIOVASCULAR AND OTHER RISKS

Estrogens and progestins should not be used for the prevention of cardiovascular disease or dementia. (See WARNINGS, Cardiovascular Disorders and Dementia.)

The Women’s Health Initiative (WHI) study reported increased risks of myocardial infarction, stroke, invasive breast cancer, pulmonary emboli, and deep vein thrombosis in postmenopausal women (50 to 79 years of age) during 5 years of treatment with oral conjugated estrogens (CE 0.625 mg) combined with medroxyprogesterone acetate (MPA 2.5 mg) relative to placebo (see CLINICAL PHARMACOLOGY, Clinical Studies).

The Women’s Health Initiative Memory Study (WHIMS), a substudy of WHI, reported increased risk of developing probable dementia in postmenopausal women 65 years of age or older during 4 years of treatment with oral conjugated estrogens plus medroxyprogesterone acetate relative to placebo. It is unknown whether this finding applies to younger postmenopausal women. (See CLINICAL PHARMACOLOGY, Clinical Studies.)

Other doses of oral conjugated estrogens with medroxyprogesterone acetate, and other combinations and dosage forms of estrogens and progestins were not studied in the WHI clinical trials and, in the absence of comparable data, these risks should be assumed to be similar. Because of these risks, estrogens with or without progestins should be prescribed at the lowest effective doses and for the shortest duration consistent with treatment goals and risks for the individual woman.

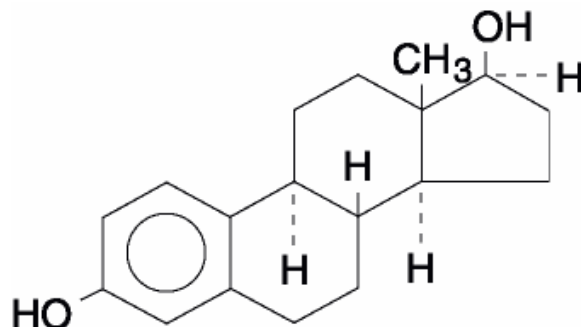
DESCRIPTION

Estraderm[®] (estradiol transdermal system) is designed to release estradiol through a rate-limiting membrane continuously upon application to intact skin.

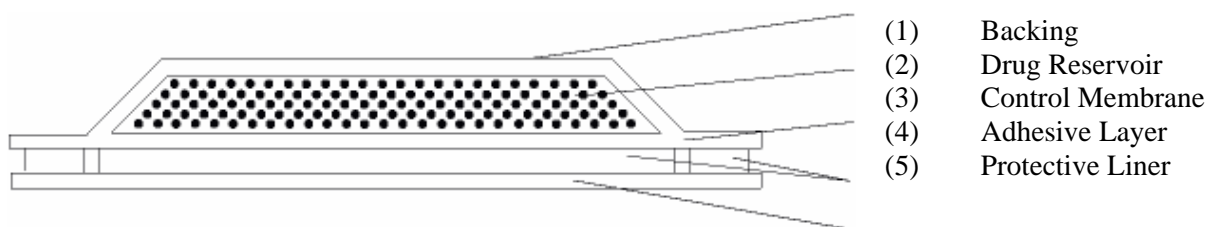
Two systems are available to provide nominal *in vivo* delivery of 0.05 or 0.1 mg of estradiol per day via skin of average permeability (interindividual variation in skin permeability is approximately 20%). Each corresponding system having an active surface area of 10 or 20 cm² contains 4 or 8 mg of estradiol USP and 0.3 or 0.6 mL of alcohol USP, respectively. The composition of the systems per unit area is identical.

Estradiol USP is a white, crystalline powder, chemically described as estra-1,3,5(10)-triene-3,17 β -diol.

The structural formula is



The Estraderm system comprises four layers. Proceeding from the visible surface toward the surface attached to the skin, these layers are (1) a transparent polyester/ethylene vinyl acetate copolymer film, (2) a drug reservoir of estradiol USP and alcohol USP gelled with hydroxypropyl cellulose NF, (3) an ethylene-vinyl acetate copolymer membrane, and (4) an adhesive formulation of light mineral oil NF and polyisobutylene. A protective liner (5) of siliconized polyester film is attached to the adhesive surface and must be removed before the system can be used.



The active component of the system is estradiol. The remaining components of the system are pharmacologically inactive. Alcohol is also released from the system during use.

CLINICAL PHARMACOLOGY

Endogenous estrogens are largely responsible for the development and maintenance of the female reproductive system and secondary sexual characteristics. Although circulating estrogens exist in a dynamic equilibrium of metabolic interconversions, estradiol is the principal intracellular human estrogen and is substantially more potent than its metabolites, estrone and estriol, at the receptor level. The primary source of estrogen in normally cycling adult women is the ovarian follicle, which secretes 70 to 500 μg of estradiol daily, depending on the phase of the menstrual cycle. After menopause, most endogenous estrogen is produced by conversion of androstenedione, secreted by the adrenal cortex, to estrone by peripheral tissues. Thus, estrone and the sulfate conjugated form, estrone sulfate, are the most abundant circulating estrogens in postmenopausal women.

Estrogens act through binding to nuclear receptors in estrogen-responsive tissues. To date, two estrogen receptors have been identified. These vary in proportion from tissue to tissue.

Circulating estrogens modulate the pituitary secretion of the gonadotropins, luteinizing hormone (LH) and follicle stimulating hormone (FSH) through a negative feedback mechanism. Estrogens act to reduce the elevated levels of these hormones seen in postmenopausal women.

In a study using transdermally administered estradiol, 0.1 mg daily, plasma levels increased by 66 pg/mL, resulting in an average plasma level of 73 pg/mL. There were no significant increases in the concentration of renin substrate or other hepatic proteins (sex hormone-binding globulin, thyroxine-binding globulin, and corticosteroid-binding globulin).

Pharmacokinetics

The skin metabolizes estradiol only to a small extent. In contrast, orally administered estradiol is rapidly metabolized by the liver to estrone and its conjugates, giving rise to higher circulating levels of estrone than estradiol. Therefore, transdermal administration produces therapeutic plasma levels of estradiol with lower circulating levels of estrone and estrone conjugates and requires smaller total doses than does oral therapy.

Absorption

Administration of Estraderm[®] (estradiol transdermal system) produces mean serum concentrations of estradiol comparable to those produced by daily oral administration of estradiol at about 20 times the daily transdermal dose. In single-application studies in 14 postmenopausal women using Estraderm systems that provided 0.05 and 0.1 mg of exogenous estradiol per day, these systems produced increased blood levels within 4 hours and maintained respective mean serum estradiol concentrations of 32 and 67 pg/mL above baseline over the application period. At the same time, increases in estrone serum concentration averaged only 9 and 27 pg/mL above baseline, respectively. Serum concentrations of estradiol and estrone returned to preapplication levels within 24 hours after removal of the system. The estimated daily urinary output of estradiol conjugates increased 5 to 10 times the baseline values and returned to near baseline within 2 days after removal of the system.

By comparison, estradiol (2 mg/day) administered orally to postmenopausal women resulted in increases in mean serum concentration of 59 pg/mL of estradiol and 302 pg/mL of estrone above baseline on the third consecutive day of dosing. Urinary output of estradiol conjugates after oral administration increased to about 100 times the baseline values and did not approach baseline until 7-8 days after the last dose.

In a 3-week multiple-application study of 14 postmenopausal women in which Estraderm 0.05 was applied twice weekly, the mean increments in steady-state serum concentration were 30 pg/mL for estradiol and 12 pg/mL for estrone. Urinary output of estradiol conjugates returned to baseline within 3 days after removal of the last (6th) system, indicating little or no estrogen accumulation in the body.

Distribution

No specific investigation of the tissue distribution of estradiol absorbed from Estraderm in humans has been conducted. The distribution of exogenous estrogens is similar to that of endogenous estrogens. Estrogens are widely distributed in the body and are generally found in higher concentrations in the sex hormone target organs. Estrogens circulate in the blood largely bound to sex hormone-binding globulin (SHBG) and albumin.

Metabolism

Exogenous estrogens are metabolized in the same manner as endogenous estrogens. Circulating estrogens exist in a dynamic equilibrium of metabolic interconversions. These transformations take place mainly in the liver. Estradiol is converted reversibly to estrone, and both can be converted to estriol, which is the major urinary metabolite. Estrogens also undergo enterohepatic recirculation via sulfate and glucuronide conjugation in the liver, biliary secretion of conjugates into the intestine, and hydrolysis in the gut followed by reabsorption. In postmenopausal women a significant portion of the circulating estrogens exist as sulfate conjugates, especially estrone sulfate, which serves as a circulating reservoir for the formation of more active estrogens.

Excretion

Estradiol, estrone and estriol are excreted in the urine along with glucuronide and sulfate conjugates.

Transdermal administration produces therapeutic serum levels of estradiol with lower circulating levels of estrone and estrone conjugates and requires smaller total doses than does oral therapy. Because estradiol has a short half-life (~1 hour), transdermal administration of estradiol allows a rapid decline in blood levels after an Estraderm system is removed, e.g., in a cycling regimen.

Special Populations

Estraderm was only investigated in postmenopausal women.

Drug Interactions

In vitro and *in vivo* studies have shown that estrogens are metabolized partially by cytochrome P450 3A4 (CYP3A4). Therefore, inducers or inhibitors of CYP3A4 may affect estrogen drug metabolism. Inducers of CYP3A4 such as St. John's Wort preparations (*Hypericum perforatum*), phenobarbital, carbamazepine and rifampin may reduce plasma concentrations of estrogens, possibly resulting in a decrease in therapeutic effects and/or changes in the uterine bleeding profile. Inhibitors of CYP3A4 such as erythromycin, clarithromycin, ketoconazole, itraconazole, ritonavir and grapefruit juice may increase plasma concentrations of estrogens and may result in side effects.

Clinical Studies

Women's Health Initiative Studies

The Women's Health Initiative (WHI) enrolled a total of 27,000 predominantly healthy postmenopausal women to assess the risks and benefits of the use of 0.625 mg conjugated

equine estrogens (CE) per day alone and of 0.625 mg conjugated equine estrogens plus 2.5 mg medroxyprogesterone acetate (MPA) per day compared to placebo in the prevention of certain chronic diseases. The primary endpoint was the incidence of coronary heart disease (CHD) (non-fatal myocardial infarction and CHD death), with invasive breast cancer as the primary adverse outcome studied. A “global index” included the earliest occurrence of CHD, invasive breast cancer, stroke, pulmonary embolism (PE), endometrial cancer, colorectal cancer, hip fracture, or death due to other causes. The study did not evaluate the effects of CE or CE/MPA on menopausal symptoms.

The CE/MPA substudy was stopped early because, according to the predefined stopping rule, the increased risk of breast cancer and cardiovascular events exceeded the specified benefits included in the “global index”. Results of the CE/MPA substudy, which included 16,608 women (average age of 63 years, range 50 to 79, 83.9% White, 6.5% Black, 5.5% Hispanic), after an average follow-up of 5.2 years are presented in Table 1 below.

Table 1
Relative and Absolute Risk Seen in the CE/MPA Substudy of WHI^a

Event ^c	Relative Risk CE/MPA vs. Placebo at 5.2 Years (95% CI)*	Placebo <u>n=8,102</u>	CE/MPA <u>n=8,506</u>
		Absolute Risk per 10,000 Woman–Years	
CHD Events	1.29 (1.02–1.63)	30	37
Non–fatal MI	1.32 (1.02–1.72)	23	30
CHD Death	1.18 (0.70–1.97)	6	7
Invasive Breast Cancer ^b	1.26 (1.00–1.59)	30	38
Stroke	1.41 (1.07–1.85)	21	29
Pulmonary Embolism	2.13 (1.39–3.25)	8	16
Colorectal Cancer	0.63 (0.43–0.92)	16	10
Endometrial Cancer	0.83 (0.47–1.47)	6	5
Hip Fracture	0.66 (0.45–0.98)	15	10
Death due to causes other than the events above	0.92 (0.74–1.14)	40	37
Global Index ^c	1.15 (1.03–1.28)	151	170
Deep Vein Thrombosis ^d	2.07 (1.49–2.87)	13	26
Vertebral Fractures ^d	0.66 (0.44–0.98)	15	9
Other Osteoporotic Fractures	0.77 (0.69–0.86)	170	131

^a adapted from JAMA, 2002: 288: 321-333

- b includes metastatic and non-metastatic breast cancer with the exception of *in situ* breast cancer
- c a subset of the events was combined in a “global index”, defined as the earliest occurrence of CHD events, invasive breast cancer, stroke, pulmonary embolism, endometrial cancer, colorectal cancer, hip fracture, or death due to other causes.
- d not included in “global index”
- * nominal confidence intervals unadjusted for multiple looks and multiple comparisons

For those outcomes included in the “global index”, absolute excess risks per 10,000 women-years in the group treated with CE/MPA were 7 more CHD events, 8 more strokes, 8 more PEs, and 8 more invasive breast cancers, while absolute risk reductions per 10,000 women-years were 6 fewer colorectal cancers and 5 fewer hip fractures. The absolute excess risk of events included in the “global index” was 19 per 10,000 women-years. There was no difference between the groups in terms of all-cause mortality. (See BOXED WARNINGS, WARNINGS, and PRECAUTIONS.)

Women’s Health Initiative Memory Study

The Women’s Health Initiative Memory Study (WHIMS), a substudy of WHI, enrolled 4,532 predominantly healthy postmenopausal women 65 years of age and older (47% were aged 65 to 69 years, 35% were 70 to 74 years, and 18% were 75 years of age and older) to evaluate the effects of CE/MPA (0.625 mg conjugated equine estrogens plus 2.5 mg medroxyprogesterone acetate) on the incidence of probable dementia (primary outcome) compared with placebo.

After an average follow-up of 4 years, 40 women in the estrogen/progestin group (45 per 10,000 women-years) and 21 in the placebo group (22 per 10,000 women-years) were diagnosed with probable dementia. The relative risk of probable dementia in the hormone therapy group was 2.05 (95% CI, 1.21 to 3.48) compared to placebo. Differences between groups became apparent in the first year of treatment. It is unknown whether these findings apply to younger postmenopausal women. (See BOXED WARNING and WARNINGS, Dementia.)

INDICATIONS AND USAGE

Estraderm[®] (estradiol transdermal system) is indicated in:

1. Treatment of moderate to severe vasomotor symptoms associated with the menopause.
2. Treatment of moderate to severe symptoms of vulvar and vaginal atrophy associated with the menopause. When prescribing solely for the treatment of symptoms of vulvar and vaginal atrophy, topical vaginal products should be considered.

3. Treatment of hypoestrogenism due to hypogonadism, castration, or primary ovarian failure.
4. Prevention of postmenopausal osteoporosis. When prescribing solely for the prevention of postmenopausal osteoporosis, therapy should only be considered for women at significant risk of osteoporosis and non-estrogen medications should be carefully considered.

The mainstays for decreasing the risk of postmenopausal osteoporosis are weight-bearing exercise, adequate calcium and vitamin D intake, and when indicated, pharmacologic therapy. Postmenopausal women require an average of 1500 mg/day of elemental calcium. Therefore, when not contraindicated, calcium supplementation may be helpful for women with suboptimal dietary intake. Vitamin D supplementation of 400-800 IU/day may also be required to ensure adequate daily intake in postmenopausal women.

CONTRAINDICATIONS

Estrogens should not be used in individuals with any of the following conditions:

1. Undiagnosed abnormal genital bleeding.
2. Known, suspected or history of cancer of the breast .
3. Known or suspected estrogen-dependent neoplasia.
4. Active deep vein thrombosis, pulmonary embolism or a history of these conditions.
5. Active or recent (e.g., within the past year) arterial thromboembolic disease (e.g., stroke, myocardial infarction).
6. Liver dysfunction or disease.
7. Estraderm[®] (estradiol transdermal system) should not be used in patients with known hypersensitivity to its ingredients.
8. Known or suspected pregnancy. There is no indication for Estraderm in pregnancy. There appears to be little or no increased risk of birth defects in children born to women who have used estrogens and progestins from oral contraceptives inadvertently during early pregnancy (see PRECAUTIONS).

WARNINGS

See BOXED WARNINGS.

The use of unopposed estrogens in women who have a uterus is associated with an increased risk of endometrial cancer.

1. Cardiovascular Disorders

Estrogen and estrogen/progestin therapy have been associated with an increased risk of cardiovascular events such as myocardial infarction and stroke, as well as venous thrombosis and pulmonary embolism (venous thromboembolism or VTE). Should any of these occur or be suspected, estrogens should be discontinued immediately.

Risk factors for arterial vascular disease (e.g., hypertension, diabetes mellitus, tobacco use, hypercholesterolemia, and obesity) and/or venous thromboembolism (e.g., personal history or family history of VTE, obesity, and systemic lupus erythematosus) should be managed appropriately.

a. Coronary Heart Disease and Stroke

In the Women's Health Initiative study (WHI), an increase in the number of myocardial infarctions and strokes has been observed in women receiving CE alone compared to placebo.

In the CE/MPA substudy of WHI an increased risk of coronary heart disease (CHD) events (defined as non-fatal myocardial infarction and CHD death) was observed in women receiving CE/MPA compared to women receiving placebo (37 vs. 30 per 10,000 women-years). The increase in risk was observed in year 1 and persisted.

In the same substudy of WHI, an increased risk of stroke was observed in women receiving CE/MPA compared to women receiving placebo (29 vs. 21 per 10,000 women-years). The increase in risk was observed after the first year and persisted.

In postmenopausal women with documented heart disease (n=2,763, average age 66.7 years) a controlled clinical trial of secondary prevention of cardiovascular disease (Heart and Estrogen/Progestin Replacement Study; HERS) treatment with CE/MPA-0.625 mg/ 2.5 mg per day demonstrated no cardiovascular benefit. During an average follow-up of 4.1 years, treatment with CE/MPA did not reduce the overall rate of CHD events in postmenopausal women with established coronary heart disease. There were more CHD events in the CE/MPA-treated group than in the placebo group in Year 1, but not during the subsequent years. Two thousand three hundred twenty-one women from the original HERS trial agreed to participate in an open label extension of HERS, HERS II. Average follow-up in HERS II was an additional 2.7 years, for a total of 6.8 years overall. Rates of CHD events were comparable among women in the CE/MPA group and in the placebo group in HERS, HERS II, and overall.

Large doses of estrogen (5 mg conjugated estrogens per day), comparable to those used to treat cancer of the prostate and breast, have been shown in a large prospective clinical trial in men to increase the risks of non-fatal myocardial infarction, pulmonary embolism, and thrombophlebitis.

b. Venous Thromboembolism (VTE)

In the Women's Health Initiative (WHI) study, an increase in VTE has been observed in women receiving CE compared to placebo.

In the CE/MPA substudy of WHI, a 2-fold greater rate of VTE, including deep vein thrombosis and pulmonary embolism, was observed in women receiving CE/MPA compared to women receiving placebo. The rate of VTE was 34 per 10,000 women-years in the CE/MPA group compared to 16 per 10,000 women-years in the placebo group. The increase in VTE risk was observed during the first year and persisted.

If feasible, estrogens should be discontinued at least 4 to 6 weeks before surgery of the type associated with an increased risk of thromboembolism, or during periods of prolonged immobilization.

2. Malignant Neoplasms

a. Endometrial Cancer

The use of unopposed estrogens in women with intact uteri has been associated with an increased risk of endometrial cancer. The reported endometrial cancer risk among unopposed estrogen users is about 2- to 12-fold greater than in non-users and appears dependent on duration of treatment and on estrogen dose. Most studies show no significant increased risk associated with the use of estrogens for less than 1 year. The greatest risk appears associated with prolonged use with increased risks of 15- to 24-fold for 5 to 10 years or more, and this risk has been shown to persist for at least 8 to 15 years after estrogen therapy is discontinued.

Clinical surveillance of all women taking estrogen/progestin combinations is important. Adequate diagnostic measures, including endometrial sampling when indicated, should be undertaken to rule out malignancy in all cases of undiagnosed persistent or recurring abnormal vaginal bleeding. There is no evidence that the use of natural estrogens results in a different endometrial risk profile than synthetic estrogens of equivalent estrogen dose. Adding a progestin to estrogen therapy has been shown to reduce the risk of endometrial hyperplasia, which may be a precursor to endometrial cancer.

b. Breast Cancer

The use of estrogens and progestins by postmenopausal women has been reported to increase the risk of breast cancer. The most important randomized clinical trial providing information about this issue is the Women's Health Initiative (WHI) substudy of CE/MPA (see CLINICAL PHARMACOLOGY, Clinical Studies). The results from observational studies are generally consistent with those of the WHI clinical trial and report no significant variation in the risk of breast cancer among different estrogens or progestins, doses, or routes of administration.

The CE/MPA substudy of WHI reported an increased risk of breast cancer in women who took CE/MPA for a mean follow-up of 5.6 years. Observational studies have also reported an increased risk for estrogen/progestin combination therapy, and a smaller increased risk for estrogen-alone therapy, after several years of use. In the WHI trial and from observational studies, the excess risk increased with duration of use. From observational studies, the risk appeared to return to baseline in about 5 years after stopping treatment. In addition, observational studies suggest that the risk of breast cancer was greater, and became apparent earlier, with estrogen/progestin combination therapy as compared to estrogen-alone therapy.

In the CE/MPA substudy, 26% of the women reported prior use of estrogen-alone and/or estrogen/progestin combination hormone therapy. After a mean follow-up of 5.6 years during the clinical trial, the overall relative risk of invasive breast cancer was 1.24 (95% confidence interval 1.01-1.54), and the overall absolute risk was 41 vs. 33 cases per 10,000 women-years, for CE/MPA compared with placebo. Among women who reported prior use of hormone therapy, the relative risk of invasive breast cancer was 1.86, and the absolute risk was 46 vs. 25 cases per 10,000 women-years, for CE/MPA compared with placebo. Among women who reported no prior use of hormone therapy, the relative risk of invasive breast cancer was 1.09, and the absolute risk was 40 vs. 36 cases per 10,000 women-years for CE/MPA compared with placebo. In the same substudy, invasive breast cancers were larger and diagnosed at a more advanced stage in the CE/MPA group compared with the placebo group. Metastatic disease was rare with no apparent difference between the 2 groups. Other prognostic factors such as histologic subtype, grade and hormone receptor status did not differ between the groups.

The use of estrogen plus progestin has been reported to result in an increase in abnormal mammograms requiring further evaluation. All women should receive yearly breast examinations by a health care provider and perform monthly breast self-examinations. In addition, mammography examinations should be scheduled based on patient age, risk factors, and prior mammogram results.

3. Dementia

In the Women's Health Initiative Memory Study (WHIMS), 4,532 generally healthy postmenopausal women 65 years of age and older were studied, of whom 35% were 70 to 74 years of age and 18% were 75 or older. After an average follow-up of 4 years, 40 women being treated with CE/MPA (1.8%, n=2,229) and 21 women in the placebo group (0.9%, n=2,303) received diagnoses of probable dementia. The relative risk for CE/MPA vs. placebo was 2.05 (95% confidence interval 1.21–3.48), and was similar for women with and without histories of menopausal hormone use before WHIMS. The absolute risk of probable dementia for CE/MPA vs. placebo was 45 vs. 22 cases per 10,000 women-years, and the absolute excess risk for CE/MPA was 23 cases per 10,000 women-years. It is unknown whether these findings apply to younger postmenopausal women. (See CLINICAL PHARMACOLOGY, Clinical Studies and PRECAUTIONS, Geriatric Use.)

4. Gallbladder Disease

A 2- to 4-fold increase in the risk of gallbladder disease requiring surgery in postmenopausal women receiving estrogens has been reported.

5. Hypercalcemia

Administration of estrogen may lead to severe hypercalcemia in patients with breast cancer and bone metastases. If this occurs, the drug should be stopped and appropriate measures taken to reduce the serum calcium level.

6. Visual Abnormalities

Retinal vascular thrombosis has been reported in patients receiving estrogens. Discontinue medication pending examination if there is sudden partial or complete loss of vision, or a sudden onset of proptosis, diplopia, or migraine. If examination reveals papilledema or retinal vascular lesions, estrogens should be permanently discontinued.

PRECAUTIONS

A. General

1. *Addition of a Progestin When a Woman Has Not Had a Hysterectomy*

Studies of the addition of a progestin for 10 or more days of a cycle of estrogen administration, or daily with estrogen in a continuous regimen, have reported a lowered incidence of endometrial hyperplasia than would be induced by estrogen treatment alone. Endometrial hyperplasia may be a precursor to endometrial cancer.

There are, however, possible risks that may be associated with the use of progestins with estrogens compared to estrogen-alone regimens. These include a possible increased risk of breast cancer.

2. *Elevated Blood Pressure*

In a small number of case reports, substantial increases in blood pressure have been attributed to idiosyncratic reactions to estrogens. In a large, randomized, placebo-controlled clinical trial, a generalized effect of estrogens on blood pressure was not seen. Blood pressure should be monitored at regular intervals with estrogen use.

3. *Hypertriglyceridemia*

In patients with pre-existing hypertriglyceridemia, estrogen therapy may be associated with elevations of plasma triglycerides leading to pancreatitis and other complications.

4. *Impaired Liver Function and Past History Cholestatic Jaundice*

Although transdermally administered estrogen therapy avoids first-pass hepatic metabolism, estrogens may be poorly metabolized in patients with impaired liver function. For patients with a history of cholestatic jaundice associated with past estrogen use or with pregnancy, caution should be exercised and in the case of recurrence, medication should be discontinued.

5. *Hypothyroidism*

Estrogen administration leads to increased thyroid-binding globulin (TBG) levels. Patients with normal thyroid function can compensate for the increased TBG by making more thyroid hormone, thus maintaining free T₄ and T₃ serum concentrations in the normal range. Patients dependent on thyroid hormone replacement therapy who are also receiving estrogens may require increased doses of their thyroid replacement therapy. These patients should have their thyroid function monitored in order to maintain their free thyroid hormone levels in an acceptable range.

6. *Fluid Retention*

Because estrogens may cause some degree of fluid retention, conditions which might be influenced by this factor, such as cardiac or renal dysfunction, warrant careful observation when estrogens are prescribed.

7. *Hypocalcemia*

Estrogens should be used with caution in individuals with severe hypocalcemia.

8. Ovarian Cancer

The CE/MPA substudy of WHI reported that estrogen plus progestin increased the risk of ovarian cancer. After an average follow-up of 5.6 years, the relative risk for ovarian cancer for CE/MPA vs. placebo was 1.58 (95% confidence interval 0.77–3.24) but was not statistically significant. The absolute risk for CE/MPA vs. placebo was 4.2 vs. 2.7 cases per 10,000 woman-years. In some epidemiologic studies, the use of estrogen-alone, in particular for 10 or more years, has been associated with an increased risk of ovarian cancer. Other epidemiologic studies have not found these associations.

9. Exacerbation of Endometriosis

Endometriosis may be exacerbated with administration of estrogens. A few cases of malignant transformation of residual endometrial implants have been reported in women treated post-hysterectomy with estrogen-alone therapy. For patients known to have residual endometriosis post-hysterectomy, the addition of progestin should be considered.

10. Exacerbation of Other Conditions

Estrogens may cause an exacerbation of asthma, diabetes mellitus, epilepsy, migraine or porphyria, systemic lupus erythematosus, and hepatic hemangiomas and should be used with caution in women with these conditions.

B. Patient Information

Physicians are advised to discuss the Patient Information leaflet with patients for whom they prescribe Estraderm[®] (estradiol transdermal system).

C. Laboratory Tests

Estrogen administration should be initiated at the lowest dose for the approved indication and then guided by clinical response, rather than by serum hormone levels (e.g., estradiol, FSH).

D. Drug/Laboratory Test Interactions

1. Accelerated prothrombin time, partial thromboplastin time, and platelet aggregation time; increased platelet count; increased factors II, VII antigen, VIII antigen, VIII coagulant activity, IX, X, XII, VII-X complex, II-VII-X complex; and beta-thromboglobulin; decreased levels of anti-factor Xa and antithrombin III; decreased antithrombin III activity; increased levels of fibrinogen and fibrinogen activity; increased plasminogen antigen and activity.
2. Increased thyroid-binding globulin (TBG) leading to increased circulating total thyroid hormone, as measured by protein-bound iodine (PBI), T₄ levels (by column or by

radioimmunoassay) or T₃ levels by radioimmunoassay. T₃ resin uptake is decreased, reflecting the elevated TBG. Free T₄ and free T₃ concentrations are unaltered. Patients on thyroid replacement therapy may require higher doses of thyroid hormone.

3. Other binding proteins may be elevated in serum (i.e., corticosteroid-binding globulin (CBG), sex hormone-binding globulin (SHBG), leading to increased circulating corticosteroids and sex steroids, respectively. Free hormone concentrations may be decreased. Other plasma proteins may be increased (angiotensinogen/renin substrate, alpha-1-antitrypsin, ceruloplasmin).
4. Increased plasma HDL and HDL₂ cholesterol subfraction concentrations, reduced LDL cholesterol concentration, increased triglycerides levels.
5. Impaired glucose tolerance.
6. Reduced response to metyrapone test.

E. Carcinogenesis, Mutagenesis, Impairment of Fertility

Long-term continuous administration of estrogen, with and without progestin, in women with and without a uterus, has shown an increased risk of endometrial cancer, breast cancer, and ovarian cancer. (See BOXED WARNING, WARNINGS and PRECAUTIONS.)

Long-term, continuous administration of natural and synthetic estrogens in certain animal species increases the frequency of carcinomas of the breast, uterus, cervix, vagina, testis, and liver.

F. Pregnancy

Estrogens should not be used during pregnancy. (See CONTRAINDICATIONS.)

G. Nursing Mothers

Estrogen administration to nursing mothers has been shown to decrease the quantity and quality of the milk. Detectable amounts of estrogens have been identified in the milk of mothers receiving this drug. Caution should be exercised when Estraderm is administered to a nursing woman.

H. Pediatric Use

Estrogen therapy has been used for the induction of puberty in adolescents with some forms of pubertal delay. Safety and effectiveness in pediatric patients have not otherwise been established.

Large and repeated doses of estrogen over an extended time period have been shown to accelerate epiphyseal closure, which could result in short adult stature if treatment is initiated before the completion of physiologic puberty in normally developing children. If estrogen is administered to patients whose bone growth is not complete, periodic monitoring of bone maturation and effects on epiphyseal centers is recommended during estrogen administration.

Estrogen treatment of prepubertal girls also induces premature breast development and vaginal cornification, and may induce vaginal bleeding. (See INDICATIONS and DOSAGE AND ADMINISTRATION.)

I. Geriatric Use

Clinical studies of Estraderm did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects. Other reported clinical experience has not identified differences in responses between the elderly and younger patients. In general, dose selection for an elderly patient should be cautious, usually starting at the low end of the range, reflecting the greater frequency of decreased hepatic, renal, or cardiac function and of concomitant disease or other drug therapy.

In the Women's Health Initiative Memory Study (WHIMS), including 4,532 women 65 years of age and older, followed for an average of 4 years, 82% (n = 3,729) were 65 to 74 while 18% (n = 803) were 75 and over. Most women (80%) had no prior hormone therapy use. Women treated with conjugated estrogens plus medroxyprogesterone acetate were reported to have a 2-fold increase in the risk of developing probable dementia. Alzheimer's disease was the most common classification of probable dementia in both the conjugated estrogens plus medroxyprogesterone acetate group and the placebo group. Ninety percent of the cases of probable dementia occurred in the 54% of women that were older than 70. (See WARNINGS, Dementia.)

ADVERSE REACTIONS

See BOXED WARNING, WARNINGS and PRECAUTIONS.

The most commonly reported adverse reaction to Estraderm[®] (estradiol transdermal system) in clinical trials was redness and irritation at the application site. This occurred in about 17% of the women treated and caused approximately 2% to discontinue therapy. Reports of rash have been rare. There have also been rare reports of severe systemic allergic reactions.

The following additional adverse reactions have been reported with estrogens:

1. Genitourinary System

Changes in vaginal bleeding pattern and abnormal withdrawal bleeding or flow; breakthrough bleeding; spotting; dysmenorrhea, increase in size of uterine leiomyomata; vaginitis, including vaginal candidiasis; change in amount of cervical secretion; changes in cervical ectropion; ovarian cancer; endometrial hyperplasia; endometrial cancer.

2. Breasts

Tenderness, enlargement, pain, nipple discharge, galactorrhea; fibrocystic breast changes; breast cancer.

3. Cardiovascular

Deep and superficial venous thrombosis; pulmonary embolism; thrombophlebitis; myocardial infarction; stroke; increase in blood pressure.

4. Gastrointestinal

Nausea, vomiting; abdominal cramps, bloating; cholestatic jaundice; increased incidence of gallbladder disease; pancreatitis, enlargement of hepatic hemangiomas.

5. Skin

Chloasma or melasma, which may persist when drug is discontinued; erythema multiforme; erythema nodosum; hemorrhagic eruption; loss of scalp hair; hirsutism; pruritus, rash.

6. Eyes

Retinal vascular thrombosis; intolerance to contact lenses.

7. Central Nervous System

Headache; migraine; dizziness; mental depression; chorea; nervousness; mood disturbances; irritability; exacerbation of epilepsy, dementia.

8. Miscellaneous

Increase or decrease in weight; reduced carbohydrate tolerance; aggravation of porphyria; edema; arthralgias; leg cramps; changes in libido; anaphylactoid/anaphylactic reactions including urticaria and angioedema; hypocalcemia; exacerbation of asthma; increased triglycerides.

OVERDOSAGE

Serious ill effects have not been reported following acute ingestion of large doses of estrogen-containing drug products by young children. Overdosage of estrogen may cause nausea and vomiting, and withdrawal bleeding may occur in females.

DOSAGE AND ADMINISTRATION

The adhesive side of the Estraderm[®] (estradiol transdermal system) system should be placed on a clean, dry area of the skin on the trunk of the body (including the buttocks and abdomen). The site selected should be one that is not exposed to sunlight. *Estraderm should not be applied to the breasts.* The Estraderm system should be replaced twice weekly. The sites of application must be rotated, with an interval of at least 1 week allowed between applications to a particular site. The area selected should not be oily, damaged, or irritated. The waistline should be avoided, since tight clothing may rub the system off. The system should be applied immediately after opening the pouch and removing the protective liner. The system should be pressed firmly in place with the palm of the hand for about 10 seconds, making sure there is good contact, especially around the edges. In the unlikely event that a system should fall off, the same system may be reapplied. If necessary, a new system may be applied. In either case, the original treatment schedule should be continued.

Initiation of Therapy

When estrogen is prescribed for a postmenopausal woman with a uterus, progestin should also be initiated to reduce the risk of endometrial cancer. A woman without a uterus does not need progestin. Use of estrogen-alone or in combination with a progestin, should be with the lowest effective dose and the shortest duration consistent with treatment goals and risks for the individual woman. Patients should be reevaluated periodically as clinically appropriate (e.g., 3-month to 6-month intervals) to determine whether treatment is still necessary (See BOXED WARNING and WARNINGS). For women who have a uterus, adequate diagnostic measures, such as endometrial sampling, when indicated, should be undertaken to rule out malignancy in cases of undiagnosed persistent or recurring abnormal vaginal bleeding.

Estraderm is currently available in two dosage forms – 0.05 mg and 0.1 mg. Patients should be started at the lowest dose. The lowest effective dose of Estraderm has not been determined.

For treatment of moderate to severe vasomotor symptoms or moderate to severe symptoms of vulvar and vaginal atrophy associated with the menopause, initiate therapy with Estraderm 0.05 applied to the skin twice weekly.

Prophylactic therapy with Estraderm to prevent postmenopausal bone loss should be initiated with the 0.05 mg/day dosage as soon as possible after menopause. The dosage may be adjusted if necessary. Discontinuation of estrogen therapy may reestablish bone loss at a rate comparable to the immediate postmenopausal period.

In women not currently taking oral estrogens, treatment with Estraderm may be initiated at once. In women who are currently taking oral estrogen, treatment with Estraderm should be initiated 1 week after withdrawal of oral hormone therapy, or sooner if menopausal symptoms reappear in less than 1 week.

Therapeutic Regimen

Estraderm therapy may be given continuously in patients who do not have an intact uterus. In those patients with an intact uterus, Estraderm may be given on a cyclic schedule (e.g., 3 weeks on drug followed by 1 week off drug).

HOW SUPPLIED

Estraderm estradiol transdermal system 0.05 mg/day – each 10 cm² system contains 4 mg of estradiol USP for nominal* delivery of 0.05 mg of estradiol per day.

Patient Calendar Pack of 8 Systems.....NDC 0078-0480-42

Estraderm estradiol transdermal system 0.1 mg/day – each 20 cm² system contains 8 mg of estradiol USP for nominal* delivery of 0.1 mg of estradiol per day.

Patient Calendar Pack of 8 Systems.....NDC 0078-0481-42

*See DESCRIPTION.

Do not store above 30°C (86°F).

Do not store unpouched. Apply immediately upon removal from the protective pouch.

Patient Information

Estraderm[®]

(estradiol transdermal system)

Rx only

Read this PATIENT INFORMATION before you start using Estraderm[®] (estradiol transdermal system) and read all the information that you get each time you refill Estraderm. There may be new information. This information does not take the place of talking to your health care provider about your medical condition or your treatment.

What is the most important information I should know about Estraderm (an estrogen hormone)?

- Estrogens increase the chances of getting cancer of the uterus.
Report any unusual vaginal bleeding right away while you are taking estrogens. Vaginal bleeding after menopause may be a warning sign of cancer of the uterus (womb). Your health care provider should check any unusual vaginal bleeding to find out the cause.
- Do not use estrogens with or without progestins to prevent heart disease, heart attacks, or strokes.
Using estrogens with or without progestins may increase your chances of getting heart attacks, strokes, breast cancer, and blood clots. Using estrogens with progestins may increase your risk of dementia. You and your health care provider should talk regularly about whether you still need treatment with Estraderm.

What is Estraderm[®]?

Estraderm is a patch that contains the estrogen hormone, estradiol. When applied to the skin as directed below, Estraderm releases estrogen through the skin into the bloodstream.

What is Estraderm used for?

Estraderm is used after menopause to:

- **Reduce moderate to severe hot flashes.**

Estrogens are hormones made by a woman's ovaries. The ovaries normally stop making estrogens when a woman is between 45 and 55 years old. This drop in body estrogen levels causes the "change of life" or menopause (the end of monthly menstrual periods). Sometimes, both ovaries are removed during an operation before natural menopause takes place. The sudden drop in estrogen levels causes "surgical menopause."

When the estrogen levels begin dropping, some women develop very uncomfortable symptoms, such as feelings of warmth in the face, neck, and chest or sudden strong feelings of heat and sweating ("hot flashes" or "hot flushes"). In some women the symptoms are mild, and they will not need estrogens. In other women, symptoms can be more severe. You and your health care provider should talk regularly about whether you still need treatment with Estraderm.

- **Treat moderate to severe dryness, itching and burning in or around the vagina.**

You and your health care provider should talk regularly about whether you still need treatment with Estraderm to control these problems. If you use Estraderm only to treat your dryness, itching, and burning in or around your vagina, talk with your health care provider about whether a topical vaginal product would be better for you.

- **Treat certain conditions in which a young woman's ovaries do not produce enough estrogens naturally.**

- **Help reduce your chances of getting osteoporosis (thin weak bones).**

Osteoporosis from menopause is a thinning of the bones that makes them weaker and easier to break. If you use Estraderm only to prevent osteoporosis from menopause, talk with your health care provider about whether a different treatment or medicine without estrogens might be better for you. You and your health care provider should talk regularly about whether you should continue with Estraderm.

Weight-bearing exercise, like walking or running, and taking calcium and vitamin D supplements may also lower your chances of getting postmenopausal osteoporosis. It is important to talk about exercise and supplements with your health care provider before starting them.

Who should not use Estraderm?

Do not start using Estraderm if you:

- **Have unusual vaginal bleeding.**
- **Currently have or have had certain cancers.**

Estrogens may increase the chances of getting certain types of cancers, including cancer of the breast or uterus. If you have or have had cancer, talk with your health care provider about whether you should take Estraderm.

- **Had a stroke or heart attack in the recent past (for example in the past year).**
- **Currently have or have had blood clots.**
- **Currently have or have had liver problems.**
- **Are allergic to Estraderm or any of its ingredients.**

See the end of this leaflet for a list of ingredients in Estraderm.

- **Think you may be, or know that you are, pregnant.**

Tell your health care provider:

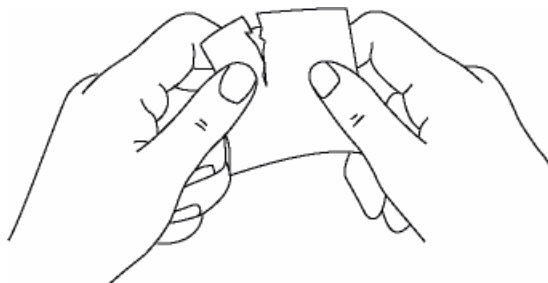
- **If you are breast-feeding.** The hormone in Estraderm can pass into your milk.
- **About all of your medical problems:** Your health care provider may need to check you more carefully if you have certain conditions such as asthma (wheezing), epilepsy (seizures), migraine, endometriosis, lupus, or problems with your heart, liver, thyroid, kidneys, or have high calcium levels in your blood.
- **About all the medicines you take,** including prescription and nonprescription medicines, vitamins, and herbal supplements. Some medicines may affect how Estraderm works. Estraderm may also affect how other medicines work.
- **If you are going to have surgery or will be on bed rest.** You may need to stop taking estrogens.

How should I use Estraderm?

1. Start at the lowest dose and talk to your health care provider about how well that dose is working for you.
2. Estrogens should be used at the lowest dose possible for your treatment, only as long as needed. The lowest effective dose of Estraderm has not been determined. You and your health care provider should talk regularly (for example, every 3 to 6 months) about the dose you are taking and whether you still need treatment with Estraderm.

How and Where to Apply Estraderm

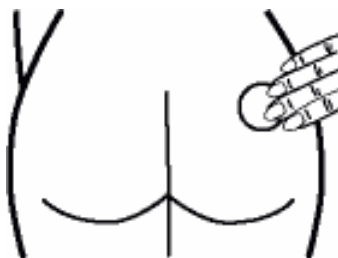
Each Estraderm system is individually sealed in a protective pouch. Tear open this pouch at the indentation (do not use scissors) and remove the system. Bubbles in the system are normal.



A stiff protective liner covers the adhesive side of the system — the side that will be placed against your skin. This liner must be removed before applying the system. Slide the protective liner sideways between your thumb and index finger. Then hold the system at one edge. Remove the protective liner and discard it. Try to avoid touching the adhesive.



Apply the adhesive side of the system to a clean, dry area of the skin on the trunk of the body (including the buttocks and abdomen).



The site selected should be one that is not exposed to sunlight. Some women may find that it is more comfortable to wear Estraderm on the buttocks. *Do not apply Estraderm to your breasts.* The sites of application must be rotated, with an interval of at least 1 week allowed between applications to a particular site. The area selected should not be oily, damaged, or irritated. Avoid the waistline, since tight clothing may rub the system off. Apply the system immediately after opening the pouch and removing the protective liner. Press the system firmly in place with the palm of your hand for about 10 seconds, making sure there is good contact, especially around the edges.

The Estraderm system should be worn continuously until it is time to replace it with a new system. You may wish to experiment with different locations when applying a new

system, to find ones that are most comfortable for you and where clothing will not rub on the system.

When to Apply Estraderm

The Estraderm system should be replaced twice weekly. Your Estraderm package contains a calendar checklist on the back to help you remember a schedule. Mark the 2-day schedule you plan to follow. Always change the system on the 2 days of the week you have marked.

When changing the system, remove the used Estraderm system and discard it. Any adhesive that might remain on your skin can be easily rubbed off. Then place the new Estraderm system on a different skin site. (The same skin site should not be used again for at least 1 week after removal of the system.)

Please note: Contact with water when you are bathing, swimming, or showering will not affect the system. In the unlikely event that a system should fall off, put this same system back on and continue to follow your original treatment schedule. If necessary, you may apply a new system but continue to follow your original schedule.

What are the possible side effects of estrogens?

Less common but serious side effects include:

- Breast Cancer
- Cancer of the Uterus
- Stroke
- Heart Attack
- Blood Clots
- Dementia
- Gallbladder Disease
- Ovarian Cancer

These are some of the warning signs of serious side effects:

- Breast Lumps
- Unusual Vaginal Bleeding
- Dizziness and Faintness
- Changes in Speech

- Severe Headaches
- Chest Pain
- Shortness of Breath
- Pains in your Legs
- Changes in Vision
- Vomiting

Call your health care provider right away if you get any of these warning signs, or any other unusual symptom that concerns you.

Common side effects include:

- Headache
- Breast Pain
- Irregular Vaginal Bleeding or Spotting
- Stomach/Abdominal Cramps, Bloating
- Nausea and Vomiting
- Hair Loss

Other side effects include:

- High Blood Pressure
- Liver Problems
- High Blood Sugar
- Fluid Retention
- Enlargement of Benign Tumors of the Uterus (“Fibroids”)
- Vaginal Yeast Infection

Other side effects of Estraderm may be possible. If you have questions, talk to your health care provider or pharmacist.

What Can I Do To Lower My Chances Of A Serious Side Effect With Estraderm?

- Talk with your health care provider regularly about whether you should continue taking Estraderm.

- If you have a uterus, talk to your health care provider about whether the addition of a progestin is right for you.
- See your health care provider right away if you get vaginal bleeding while taking Estraderm.
- Have a breast exam and mammogram (breast X-ray) every year unless your health care provider tells you something else. If members of your family have had breast cancer or if you have ever had breast lumps or an abnormal mammogram, you may need to have breast exams more often.
- If you have high blood pressure, high cholesterol (fat in the blood), diabetes, are overweight, or if you use tobacco, you may have higher chances for getting heart disease. Ask your health care provider for ways to lower your chances for getting heart disease.

General Information About Safe And Effective Use Of Estraderm

Medicines are sometimes prescribed for conditions that are not mentioned in patient information leaflets. Do not take Estraderm for conditions for which it was not prescribed. Do not give Estraderm to other people, even if they have the same symptoms you have. It may harm them. **Keep Estraderm out of the reach of children.**

This leaflet provides a summary of the most important information about Estraderm. If you would like more information, talk with your health care provider or pharmacist. You can ask for information about Estraderm that is written for health professionals. You can get more information by calling the toll-free number (888-NOW-NOVA (888-669-6682).

What Are The Ingredients In Estraderm?

The Estraderm system comprises four layers. Proceeding from the visible surface toward the surface attached to the skin, these layers are (1) a transparent polyester/ethylene vinyl acetate copolymer film, (2) a drug reservoir of estradiol USP and alcohol USP gelled with hydroxypropyl cellulose NF, (3) an ethylene-vinyl acetate copolymer membrane, and (4) an adhesive formulation of light mineral oil NF and polyisobutylene. A protective liner (5) of siliconized polyester film is attached to the adhesive surface and must be removed before the system can be used.

The active component of the system is estradiol. The remaining components of the system are pharmacologically inactive. Alcohol is also released from the system during use.

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