PREMARIN®
(conjugated estrogens)

1. NAME OF THE MEDICINAL PRODUCT

PREMARIN®

2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Conjugated Estrogens

Each tablet contains 0.3 mg of conjugated estrogens.

3. PHARMACEUTICAL FORM

Tablets

4. CLINICAL PARTICULARS

4.1. THERAPEUTIC INDICATIONS

Treatment of moderate to severe vasomotor symptoms due to menopause.

Treatment of vulvar and vaginal atrophy due to menopause. When prescribing solely for the treatment of symptoms of vulvar and vaginal atrophy, topical vaginal products should be considered.

Prevention of postmenopausal osteoporosis in women at risk of future fractures.[1,100]

Treatment of hypoestrogenism due to hypogonadism, castration or primary ovarian failure.

Treatment of breast cancer (for palliation only) in appropriately selected women and men with metastatic disease.

Treatment of advanced androgen-dependent carcinoma of the prostate (for palliation only).

4.2. POSOLOGY AND METHOD OF ADMINISTRATION

The benefits and risks of estrogen therapy (ET) must always be carefully weighed, including consideration of the emergence of risks as therapy continues (see section 4.4 Special Warnings and Precautions for Use, Malignant neoplasm). 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.

Tablets should be taken whole; do not divide, crush, chew, or dissolve tablets in mouth.[100]

Treatment of moderate to severe vasomotor symptoms and/or vulvar and vaginal atrophy associated with menopause[100]

If an estrogen is prescribed for a postmenopausal woman with a uterus, the addition of a progestin may be appropriate (see section 4.4 Special Warning and Precautions for Use, Malignant neoplasms). In some

cases, hysterectomized women with a history of endometriosis may need a progestin[2] (see section 4.4 Special Warnings and Precautions for Use, Exacerbation of other conditions).

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.[100]

Treatment of female hypogonadism

- Administer cyclically (e.g., three weeks on and one week off).[100]

Treatment of female castration or primary ovarian failure

- Administer cyclically (e.g., three weeks on and one week off).[100]

Treatment of breast cancer (for palliation only)

- 10 mg three times daily, for a period of at least three months.[100]

Treatment of advanced androgen-dependent carcinoma of the prostate (for palliation only)

- 1.25 mg to 2.5 mg three times daily.[100]

Use in children

Safety and effectiveness in pediatric patients have not been established. Estrogen treatment of prepubertal girls induces premature breast development and vaginal cornification, and may induce uterine bleeding.[100]

Since large and repeated doses of estrogen over an extended time period have been shown to accelerate epiphyseal closure, hormonal therapy should not be started before epiphyseal closure has occurred in order not to compromise final growth.[5,100]

Use in elderly patients

There have not been sufficient numbers of geriatric women involved in clinical studies utilizing PREMARIN to determine whether those over 65 years of age differ from younger subjects in their response to PREMARIN.

The Women's Health Initiative Study (WHI)

In the WHI estrogen-alone substudy (daily CE [0.625 mg] versus placebo), there was a higher relative risk of stroke in women greater than 65 years of age (see section 5.1 Pharmacodynamic Properties, WHI Studies).[6]

The Women's Health Initiative Memory Study (WHIMS)

In the WHIMS of postmenopausal women 65 to 79 years of age, there was increased risk of developing probable dementia in women receiving estrogen alone when compared to placebo. It is unknown whether this finding applies to younger postmenopausal women.[7] (see section 4.4 Special Warnings and Precautions for Use, Dementia and section 5.1 Pharmacodynamic Properties, WHIM Study[7])

4.3. CONTRAINDICATIONS

- Known or suspected pregnancy (see section 4.6 Fertility, Pregnancy and Lactation).

- Undiagnosed abnormal uterine bleeding.
- Known, suspected, or history of breast cancer.[100]
- Known or suspected estrogen-dependent neoplasia (e.g., endometrial cancer, endometrial hyperplasia).
- Active or history of confirmed arterial thromboembolic disease (e.g., stroke, myocardial infarction) or venous thromboembolism (such as deep venous thrombosis, pulmonary embolism).
- Active or chronic liver dysfunction or disease.
- Known thrombophilic disorders (e.g., protein C, protein S, or antithrombin deficiency).[8,9,10,11]
- Hypersensitivity to any component of this medication.

4.4. SPECIAL WARNINGS AND PRECAUTIONS FOR USE

General

Combined Estrogen and Progestin Therapy**:** There are additional and/or increased risks that may be associated with the use of combination estrogen-plus-progestin therapy compared with using estrogen-alone regimens. These include an increased risk of myocardial infarction, pulmonary embolism, invasive breast cancer and ovarian cancer.[12,13,14,15]

Cardiovascular risk

ET has been reported to increase the risk of stroke[6] and deep venous thrombosis (DVT).[16]

Patients who have risk factors for thrombotic disorders should be kept under careful observation.

Patients who are at risk of developing migraines with aura may be at risk of ischemic stroke and should be kept under careful observation.[17]

Stroke

In the WHI estrogen-alone substudy, a statistically significant increased risk of stroke was reported in women 50 to 79 years of age receiving daily CE (0.625 mg) compared to women receiving placebo (45 versus 33 per 10,000 women-years). The increase in risk was demonstrated in year one and persisted.[6]

Subgroup analyses of women 50 to 59 years of age suggest no increased risk of stroke for those women receiving CE (0.625 mg) versus those receiving placebo (18 versus 21 per 10,000 women-years).[18,100]

Should a stroke occur or be suspected, PREMARIN should be discontinued immediately (see section 5.1 Pharmacodynamic Properties).[6]

Venous thromboembolism (VTE)

In the estrogen-alone substudy of WHI, the increased risk of deep venous thrombosis (DVT) was reported to be statistically significant (23 vs. 15 per 10,000 person-years). The risk of pulmonary embolism (PE) was reported to be increased, although it did not reach statistical significance. The increase in venous thromboembolism (VTE, DVT and PE) risk was demonstrated during the first two years (30 vs. 22 per 10,000 person-years).[16]

Should a VTE occur or be suspected, PREMARIN should be discontinued immediately (see section 5.1 Pharmacodynamic Properties).[16]

If visual abnormalities develop, discontinue PREMARIN 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, PREMARIN should be withdrawn. Retinal vascular thrombosis has been reported in patients receiving estrogens with or without progestins.[19,20,21,22,23,24]

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

Malignant neoplasms

Endometrial cancer

The use of unopposed estrogens in women with an intact-uterus has been associated with an increased risk of endometrial cancer (see section 4.4 Special Warnings and Precautions for Use, Exacerbation of other conditions and section 5.1 Pharmacodynamic Properties).

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. 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 ET is discontinued. Adding a progestin to postmenopausal estrogen therapy has been shown to reduce the risk of endometrial hyperplasia, which may be a precursor to endometrial cancer (see section 4.4 Special Warnings and Precautions for Use, General).[12,15]

Clinical surveillance of all women taking estrogen or estrogen-plus-progestin combinations is important. Adequate diagnostic measures should be undertaken to rule out malignancy in all cases of undiagnosed persistent or recurring abnormal uterine bleeding.

Breast cancer

Studies involving the use of estrogens by postmenopausal women have reported inconsistent results on the risk of breast cancer. The most important randomized clinical trial providing information about this issue is the WHI (see section 5.1 Pharmacodynamic Properties). In the estrogen-alone substudy of WHI, after an average of 7.1 years of follow-up, CE (0.625 mg daily) was not associated with an increased risk of invasive breast cancer.[25]

Some observational studies have reported an increased risk of breast cancer for estrogen-alone therapy after several years of use. The risk increased with duration of use, and appeared to return to baseline within approximately five years after stopping treatment (only the observational studies have substantial data on risk after stopping).[26,27,100]

The use of estrogen therapy has been reported to result in an increase in abnormal mammograms requiring further evaluation.[25]

Ovarian cancer

In some epidemiologic studies, the use of estrogen therapy has been associated with an increased risk of ovarian cancer over multiple years of use. Other epidemiologic studies have not found these associations.[12]

Dementia

The estrogen-alone arm of the WHIMS, an ancillary study of WHI that enrolled postmenopausal women between the ages of 65-79 years, reported a relative risk (HR) of probable dementia for conjugated estrogens alone versus placebo of 1.49 [HR 1.49 (95% CI 0.83-2.66)] (see section 5.1 Pharmacodynamic Properties).[7]

It is unknown whether these findings apply to younger postmenopausal women.[7]

Gallbladder disease

A 2 to 4-fold increase in the risk of gallbladder disease requiring surgery in women receiving ET has been reported.[10]

Hypercalcemia

Administration of estrogens 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.[28]

Palliative therapy in men

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.[29]

Immune

Angioedema

Exogenous estrogens may induce or exacerbate symptoms of angioedema, particularly in patients with hereditary angioedema.[30,31,32,33]

Fluid retention

Because estrogens may cause some degree of fluid retention, patients with conditions which might be influenced by this factor, such as cardiac or renal dysfunction, warrant careful observation when estrogens are prescribed.[34,35,36,100]

Hypertriglyceridemia

In the Health and Osteoporosis, Progestin and Estrogen (HOPE) Study, the mean percent increases from baseline in serum triglycerides after one year of treatment with CE 0.625 mg, 0.45 mg, 0.3 mg and placebo were 34.2, 30.2, 25.0, and 10.8, respectively.[37,100]

Caution should be exercised in patients with pre-existing hypertriglyceridemia since rare cases of large increases of plasma triglycerides leading to pancreatitis have been reported with estrogen therapy in this population.[38,100]

Impaired liver function and history of cholestatic jaundice

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. Estrogens may be poorly metabolized in patients with impaired liver function.[39]

Elevated blood pressure

In a small number of case reports, substantial increases in blood pressure during ET have been attributed to idiosyncratic reactions to estrogens. In a large, randomized, placebo-controlled clinical trial a generalized effect of ET on blood pressure was not seen.[40,41,42,43,44,45,46]

Exacerbation of other conditions

Estrogen therapy may cause an exacerbation of asthma, epilepsy, migraine with or without aura,[47,48,49] otosclerosis,[50,51] porphyria, systemic lupus erythematosus, and hepatic hemangiomas[52] and should be used with caution in women with these conditions.

Endometriosis may be exacerbated with administration of estrogen therapy. A few cases of malignant transformation of residual endometrial implants have been reported in women treated post-hysterectomy with estrogen-alone therapy. For women known to have residual endometriosis post-hysterectomy, the addition of progestin should be considered.[53,100]

Hypocalcemia

Estrogens should be used with caution in patients with disease that can predispose to severe hypocalcemia.[54]

Hypothyroidism

Estrogen administration leads to increased thyroid-binding globulin (TBG) levels. Patients dependent on thyroid hormone therapy, who are receiving estrogens, may require increased doses of their thyroid replacement therapy. These women should have their thyroid function monitored in order to maintain their free thyroid hormone levels in an acceptable range.[55](see section 4.5 Interaction with Other Medicinal Products and Other Forms of Interaction).

Laboratory monitoring[100]

Estrogen administration should be guided by clinical response rather than by hormone levels (e.g., estradiol, FSH).

4.5. INTERACTION WITH OTHER MEDICINAL PRODUCTS AND OTHER FORMS OF INTERACTION

Data from a drug-drug interaction study involving conjugated estrogens and medroxyprogesterone acetate (MPA) indicate that the pharmacokinetic disposition of both drugs is not altered when the drugs are co-administered. Other clinical drug-drug interaction studies have not been conducted with conjugated estrogens.

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 (*Hypericum perforatum*) preparations, phenobarbital, phenytoin, carbamazepine, rifampicin and dexamethasone[100] 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 cimetidine, erythromycin, clarithromycin, ketoconazole, itraconazole, ritonavir and grapefruit juice[100], may increase plasma concentrations of estrogens and may result in side effects.

Interference with Laboratory and Other Diagnostic Tests[100]

Laboratory test interactions[100]

Increased platelet count decreased levels of antithrombin III and increased plasminogen antigen and activity.

Estrogens increase thyroid-binding globulin (TBG) leading to increased circulating total thyroid hormone, as measured by protein-bound iodine (PBI), T_4 levels by column or by radioimmunoassay or T_3 levels by radioimmunoassay. T_3 resin uptake is decreased, reflecting the elevated TBG. Free T_4 and free T_3 concentrations are unaltered.

Other binding proteins may be elevated in serum, i.e., corticosteroid binding globulin (CBG), sex hormone-binding globulin (SHBG) leading to increased circulating corticosteroid and sex steroids, respectively. Free or biologically active hormone concentrations may be decreased.[58]

Increased plasma HDL and HDL_2 cholesterol subfraction concentrations, reduced LDL cholesterol concentrations, increased triglyceride levels.

Impaired glucose tolerance.The response to metyrapone may be reduced.

4.6. FERTILITY, PREGNANCY AND LACTATION

Pregnancy

PREMARIN should not be used during pregnancy (see section 4.3 Contraindications).

If pregnancy occurs during medication with PREMARIN treatment should be withdrawn immediately.[100]

Lactation

PREMARIN should not be used during lactation.[59,100]

Estrogen administration to nursing mothers has been shown to decrease the quantity and quality of breast milk. Detectable amounts of estrogens have been identified in the milk of mothers receiving the drug. Caution should be exercised when estrogens are administered to a nursing woman.[59]

4.7. EFFECTS ON ABILITY TO DRIVE AND USE MACHINES

No studies on the effect of ability to drive or use machines have been performed.[100]

4.8. UNDESIRABLE EFFECTS

Adverse reactions are listed in the Table in CIOMS frequency categories:[74]		
Very Common:	≥10%	
Common:	≥1% and <10%	
Uncommon:	≥0.1% and <1%	
Rare:	≥0.01% and <0.1%	
Very rare:	<0.01%	
Unknown	Cannot be estimated from the available data	

TABLE 1: ADVERSE DRUG REACTION TABLE	
System Organ Class	**Adverse Drug Reaction**
Infections and infestations	
Uncommon	Vaginitis, including vaginal candidiasis
Neoplasms benign, malignant and unspecified (including cysts and polyps)	
Rare	Breast cancer; ovarian cancer[12]; fibrocystic breast changes[66]; growth potentiation of benign meningioma[67,68]
Very rare	Endometrial cancer; enlargement of hepatic hemangiomas[52]
Immune system disorders	
Uncommon	Hypersensitivity[69]
Rare	Urticaria, angioedema[70]; anaphylactic/anaphylactoid reactions
Metabolism and nutrition disorders	
Rare	Glucose intolerance
Very rare	Exacerbation of porphyria; hypocalcemia (in patients with disease that can predispose to severe hypocalcemia)[71]

Psychiatric disorders	
Uncommon	Changes in libido; mood disturbances; depression; dementia[7]
Rare	Irritability
Nervous system disorders	
Uncommon	Dizziness; headache; migraine; nervousness
Rare	Cerebrovascular accident/stroke; exacerbation of epilepsy
Very rare	Exacerbation of chorea[63]
Eye disorders	
Uncommon	Intolerance to contact lenses
Very rare	Retinal vascular thrombosis
Cardiac disorders	
Rare	Myocardial infarction[14]
Vascular disorders	
Uncommon	Venous thrombosis[16]; pulmonary embolism[16,72]
Rare	Superficial thrombophlebitis[64]
Respiratory, thoracic and mediastinal disorders	
Rare	Exacerbation of asthma
Gastrointestinal disorders	
Uncommon	Nausea; bloating; abdominal pain
Rare	Vomiting; pancreatitis; ischemic colitis[62]
Hepatobiliary disorders	
Uncommon	Gallbladder disease[65]
Very rare	Cholestatic jaundice
Skin and subcutaneous tissue disorders	
Common	Alopecia
Uncommon	Chloasma/melasma; hirsutism; pruritus; rash
Very rare	Erythema multiforme; erythema nodosum
Musculoskeletal and connective tissue disorders	
Common	Arthralgia; leg cramps
Reproductive system and breast disorders	
Common	Abnormal uterine bleeding; breast pain, tenderness, enlargement, discharge; leukorrhea[60]
Uncommon	Change in menstrual flow; change in cervical ectropion and secretion
Rare	Dysmenorrhea/pelvic pain; galactorrhea; increased size of uterine leiomyomata
Very rare	Endometrial hyperplasia
Unknown	Gynecomastia in males[61]
General disorders and administration site conditions	
Uncommon	Edema
Investigations	
Common	Changes in weight (increase or decrease); increased triglycerides[73]
Very rare	Increases in blood pressure

4.9. OVERDOSE

Symptoms of overdosage of estrogen-containing products in adults and children may include nausea, vomiting, breast tenderness, dizziness, abdominal pain, drowsiness/fatigue; withdrawal bleeding may occur in females. There is no specific antidote and further treatment if necessary should be symptomatic.[82]

5. PHARMACOLOGICAL PROPERTIES

5.1. PHARMACODYNAMIC PROPERTIES

Mechanism of Action[100]

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.[100]

The primary source of estrogen in normally cycling adult women is the ovarian follicle, which secretes 70 to 500 mcg of estradiol daily, depending on the phase of the menstrual cycle. After menopause, most endogenous estrogen is produced by conversion of androstenedione, which is secreted by the adrenal cortex, to estrone in the peripheral tissues. Thus, estrone and the sulfate-conjugated form, estrone sulfate, are the most abundant circulating estrogens in postmenopausal women.[100]

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 gonadotropins seen in postmenopausal women.[83,84,100]

Pharmacodynamics

Currently, there are no pharmacodynamic data known for CE alone.

Effects on vasomotor symptoms[100]

In the first year of the Health and Osteoporosis, Progestin and Estrogen (HOPE) Study, a total of 2,805 postmenopausal women (average age 53.3 ± 4.9 years) were randomly assigned to one of eight treatment groups, receiving either placebo or conjugated estrogens, with or without medroxyprogesterone acetate. Efficacy for vasomotor symptoms was assessed during the first 12 weeks of treatment in a subset of symptomatic women (n = 241) who had at least seven moderate-to-severe hot flushes daily, or at least 50 moderate-to-severe hot flushes during the week before randomization. With CE (0.3 mg, 0.45 mg, and 0.625 mg tablets), the decrease of both the frequency and severity of moderate-to-severe vasomotor symptoms was shown to be statistically improved compared with placebo at Weeks 4 and 12.

Table 2 shows the observed mean number of hot flushes in the CE 0.3 mg, 0.45 mg, and 0.625 mg and placebo treatment groups over the initial 12-week period.[85]

TABLE 2: SUMMARY TABULATION OF THE NUMBER OF HOT FLUSHES PER DAY–MEAN VALUES AND COMPARISONS BETWEEN THE CE TREATMENT GROUPS AND THE PLACEBO GROUP: PATIENTS WITH AT LEAST 7 MODERATE TO SEVERE FLUSHES PER DAY OR AT LEAST 50 PER WEEK AT BASELINE, EFFICACY EVALUABLE (EE) POPULATION[85]

Treatment (No. of Patients)	---------- No. of Hot Flushes/Day ----------			
Time Period (week)	**Baseline Mean ± SD**	**Observed Mean ± SD**	**Mean Change ± SE[a]**	**p-Values vs. Placebo[a]**
0.625 mg CE				
4 (n=27)	12.29 ± 3.89	1.95 ± 2.77	-10.34 ± 0.90	<0.001
12 (n=26)	12.03 ± 3.73	0.45 ± 0.95	-11.58 ± 0.88	<0.001
0.45 mg CE				
4 (n=32)	12.25 ± 5.04	5.04 ± 5.31	-7.21 ± 0.83	<0.001
12 (n=30)	12.49 ± 5.11	2.33 ± 3.39	-10.16 ± 0.82	<0.001
0.3 mg CE				
4 (n=30)	13.77 ± 4.78	4.65 ± 3.71	-9.12 ± 0.85	<0.001
12 (n=29)	13.83 ± 4.86	2.20 ± 2.73	-11.63 ± 0.83	<0.001
Placebo				
4 (n=28)	11.69 ± 3.87	7.89 ± 5.28	-3.80 ± 0.88	-
12 (n=25)	11.61 ± 3.79	5.27 ± 4.97	-6.34 ± 0.89	-
[a] Standard errors based on assumption of equal variances.				

Effects on vulvar and vaginal atrophy[100]

Results of vaginal maturation indexes at cycles 6 and 13 showed that the differences from placebo were statistically significant ($p < 0.001$) for all treatment groups.[85]

Effects on bone mineral density[100]

Health and Osteoporosis, Progestin and Estrogen (HOPE) Study[100]
The HOPE study was a double-blind, randomized, placebo/active-drug-controlled, multicenter study of healthy postmenopausal women with an intact uterus. Subjects (mean age 53.3 ± 4.9 years) were 2.3 ± 0.9 years on average since menopause and took one 600 mg tablet of elemental calcium (Caltrate™) daily. Subjects were not given Vitamin D supplements. They were treated with CE 0.625 mg, 0.45 mg, 0.3 mg, or placebo. Prevention of bone loss was assessed by measurement of bone mineral density (BMD), primarily at the anteroposterior lumbar spine (L2 to L4). Secondarily, BMD measurements of the total body, femoral neck, and trochanter were also analyzed. Serum osteocalcin, urinary calcium, and N-telopeptide were used as bone turnover markers (BTM) at cycles 6, 13, 19, and 26.[89]

Intent-to-treat subjects[100]
All active treatment groups showed significant differences from placebo in each of the four BMD endpoints at cycles 6, 13, 19, and 26. The percent changes from baseline to final evaluation are shown in Table 3.[89]

TABLE 3: PERCENT CHANGE IN BONE MINERAL DENSITY: COMPARISON BETWEEN CE AND PLACEBO GROUPS IN THE INTENT-TO-TREAT POPULATION, LOCF[89]

Region Evaluated Treatment Group[a]	No. of Subjects	Baseline (g/cm^2) Mean ± SD	Change from Baseline (%) Adjusted Mean ± SE	p-Value vs. Placebo
L_2 to L_4 BMD				
0.625	83	1.17 ± 0.15	2.32 ± 0.35	<0.001
0.45	91	1.13 ± 0.15	2.08 ± 0.34	<0.001
0.3	87	1.14 ± 0.15	1.24 ± 0.34	<0.001
Placebo	85	1.14 ± 0.14	-2.46 ± 0.35	
Total Body BMD				
0.625	84	1.15 ± 0.08	0.66 ± 0.17	<0.001
0.45	91	1.14 ± 0.08	0.71 ± 0.16	<0.001
0.3	87	1.14 ± 0.07	0.37 ± 0.16	<0.001
Placebo	85	1.13 ± 0.08	-1.52 ± 0.16	
Femoral Neck BMD				
0.625	84	0.91 ± 0.14	1.74 ± 0.43	<0.001
0.45	91	0.89 ± 0.13	1.95 ± 0.41	<0.001
0.3	87	0.86 ± 0.11	0.57 ± 0.42	<0.001
Placebo	85	0.88 ± 0.14	-1.81 ± 0.43	
Femoral Trochanter BMD				
0.625	84	0.78 ± 0.13	3.78 ± 0.57	<0.001
0.45	91	0.76 ± 0.12	3.46 ± 0.54	<0.001
0.3	87	0.75 ± 0.10	3.19 ± 0.55	0.003
Placebo	85	0.75 ± 0.12	0.93 ± 0.56	

[a] Identified by dosage (mg) of CE or placebo.
BMD = Bone mineral density; L_2 to L_4 = anteroposterior lumbar spine; LOCF = Last observation carried forward; SD = Standard deviation; SE = Standard error.

The bone turnover markers serum osteocalcin and urinary N-telopeptide significantly decreased ($p < 0.001$) in all active-treatment groups at cycles 6, 13, 19, and 26 compared with the placebo group. Larger mean decreases from baseline were seen with the active groups than with the placebo group. Significant differences from placebo were seen less frequently in urine calcium.[89]

Effects on female hypogonadism[100]

In clinical studies of delayed puberty due to female hypogonadism, breast development was induced by doses as low as 0.15 mg. The dosage may be gradually titrated upward at 6- to 12-month intervals as needed to achieve appropriate bone age advancement and eventual epiphyseal closure. Available data suggest that chronic dosing with 0.625 mg is sufficient to induce artificial cyclic menses with sequential progestin treatment and to maintain bone mineral density after skeletal maturity is achieved.[90,91,92,93,94]

Women's Health Initiative Studies (WHI)

The Women's Health Initiative (WHI) enrolled approximately 27,000 predominantly healthy postmenopausal women in two substudies to assess the risks and benefits of CE [0.625 mg daily] alone or in combination with MPA [0.625 mg/2.5 mg daily] compared to placebo in the prevention of certain chronic diseases. The primary endpoint was the incidence of coronary heart disease [(CHD), defined as nonfatal myocardial infarction (MI), silent MI and CHD death], with invasive breast cancer as the primary adverse outcome. A "global index" included the earliest occurrence of CHD, invasive breast cancer, stroke, pulmonary embolism (PE), endometrial cancer (only in the CE plus MPA substudy), colorectal cancer, hip fracture, or death due to other causes. The study did not evaluate the effects of CE alone or CE plus MPA on menopausal symptoms.

WHI Estrogen-alone Substudy

The WHI estrogen-alone substudy was stopped early because an increased risk of stroke was observed, and it was deemed that no further information would be obtained regarding the risks and benefits of estrogen alone in predetermined primary endpoints.

Results of the estrogen-alone substudy, which included 10,739 women (average age of 63.6 years, range 50 to 79; 75.3% White, 15.1% Black, 6.1% Hispanic, 3.6% Other)[100], after an average follow-up of 7.1 years, are presented in the table 4 below.

In the estrogen-alone substudy of WHI, there was no significant overall effect on the relative risk (RR) of CHD (RR 0.95, 95% nominal confidence interval [nCI] 0.78-1.16)[18]; a slightly elevated RR of CHD was reported in the early follow-up period and diminished over time. There was no significant effect on the RR of invasive breast cancer (RR 0.80, 95% nCI 0.62-1.04)[25] or colorectal cancer (RR 1.08, 95% nCI 0.75-1.55)[95] reported. Estrogen use was associated with a statistically significant increased risk of stroke (RR 1.33, 95% nCI 1.05-1.68)[18] and deep vein thrombosis (DVT) (RR 1.47, 95% nCI 1.06-2.06).[16] The RR of PE (RR 1.37, 95% nCI 0.90-2.07)[16] was not significantly increased. A statistically significant reduced risk of hip, vertebral and total fractures was reported with estrogen use [(RR 0.65, 95% nCI 0.45-0.94), (RR 0.64, 95% nCI 0.44-0.93), and (RR 0.71, 95% nCI 0.64-0.80), respectively].[96] The estrogen-alone substudy did not report a statistically significant effect on death due to other causes (RR 1.08, 95% nCI 0.88-1.32)[95] or an effect on overall mortality risk (RR 1.04, 95% nCI 0.88-1.22).[95] These confidence intervals are unadjusted for multiple looks and multiple comparisons.

TABLE 4: RELATIVE AND ABSOLUTE RISK SEEN IN THE ESTROGEN-ALONE SUBSTUDY OF WHI[a]			
Event	**Relative Risk CE vs. placebo (95% nCI[b])**	**Placebo n = 5,429**	**CE n = 5,310**
		Absolute Risk per 10,000 Women-Years	
CHD events[c] [18]	0.95 (0.78–1.16)	57	54
Non-fatal MI[c] [14]	0.91 (0.73–1.14)	43	40
CHD death[c][14]	1.01 (0.71–1.43)	16	16
All Strokes[b] [18]	1.33 (1.05–1.68)	33	45
Ischemic stroke[c] [6]	1.55 (1.19–2.01)	25	38
Deep vein thrombosis[c,d] [16]	1.47 (1.06–2.06)	15	23
Pulmonary embolism[e,16]	1.37 (0.90–2.07)	10	14
Invasive breast cancer[c] [25]	0.80 (0.62–1.04)	34	28
Colorectal cancer[e,72]	1.08 (0.75–1.55)	16	17
Hip fracture[c,96]	0.65 (0.45–0.94)	19	12
Vertebral fractures[c,d] [96]	0.64 (0.44-0.93)	18	11
Lower arm/wrist fractures[c,d] [96]	0.58 (0.47–0.72)	59	35
Total fractures[c,d] [96]	0.71 (0.64–0.80)	197	144
Death due to other causes[e,f] [72]	1.08 (0.88–1.32)	50	53
Overall mortality[c,d] [18]	1.04 (0.88–1.22)	75	79
Global Index[g] [18]	1.02 (0.92–1.13)	201	206

[a] Adapted from numerous WHI publications. WHI publications can be viewed at www.nhlbi.nih.gov/whi
[b] Nominal confidence intervals unadjusted for multiple looks and multiple comparisons.
[c] Results are based on centrally adjudicated data for an average follow-up of 7.1 years.
[d] Not included in global index.
[e] Results are based on an average follow-up of 6.8 years.
[f] All deaths, except from breast or colorectal cancer, definite/probable CHD, PE or cerebrovascular disease.
[g] 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, colorectal cancer, hip fracture, or death due to other causes.

Table 5 describes the primary results of the Estrogen-alone substudy stratified by age at baseline.[100]

TABLE 5: WOMEN'S HEALTH INITIATIVE ESTROGEN-ALONE SUBSTUDY RESULTS STRATIFIED BY AGE AT BASELINE						
	AGE					
Endpoint	**50-59 years**		**60-69 years**		**70-79 years**	
	CE (N=1637)	**Placebo (N=1673)**	**CE (N=2387)**	**Placebo (N=2465)**	**CE (N=1286)**	**Placebo (N=1291)**
CHD[a,b,18]						
Number of cases	21	34	96	106	84	77
Absolute risk (N)[c]	17	27	58	62	98	88
Hazard ratio (95% CI)	0.63 (0.36-1.09)		0.94 (0.71-1.24)		1.13 (0.82-1.54)	
Stroke[b,18]						
Number of cases	18	21	84	54	66	52
Absolute risk (N)[c]	15	17	51	31	76	59
Hazard ratio (95% CI)	0.89 (0.47-1.69)		1.62 (1.15-2.27)		1.21 (0.84-1.75)	
DVT[b,16]						
Number of cases	16	10	39	29	30	20
Absolute risk (N)[c]	13	8	23	17	34	22
Hazard ratio[d] (95% CI)	1.64 (0.74-3.60)		3.02 (1.51-6.06)		4.54 (2.22-9.31)	
VTE [b,16]						
Number of cases	20	15	54	43	37	28
Absolute risk (N)[c]	16	12	32	25	42	31
Hazard ratio [d] (95% CI)	1.37 (0.70-2.68)		2.82 (1.59-5.01)		3.77 (2.07-6.89)	
Pulmonary Embolism [b 16,]						
Number of cases	12	8	28	17	12	14
Absolute risk (N)[c]	10	6	17	10	14	16
Hazard ratio[d] (95% CI)	1.54 (0.63-3.77)		2.80 (1.28-6.16)		2.36 (0.96-5.80)	
Invasive Breast Cancer[95]						
Number of cases	25	35	42	60	27	29
Absolute risk (N)[c]	21	29	26	36	32	34
Hazard ratio (95% CI)	0.72 (0.43-1.21)		0.72 (0.49-1.07)		0.94 (0.56-1.60)	
Colorectal Cancer[95]						
Number of cases	8	14	26	31	27	13
Absolute risk (N)[c]	7	12	16	19	32	15
Hazard ratio (95% CI)	0.59 (0.25-1.41)		0.88 (0.52-1.48)		2.09 (1.08-4.04)	

TABLE 5: WOMEN'S HEALTH INITIATIVE ESTROGEN-ALONE SUBSTUDY RESULTS STRATIFIED BY AGE AT BASELINE						
	AGE					
Endpoint	**50-59 years**		**60-69 years**		**70-79 years**	
	CE (N=1637)	**Placebo (N=1673)**	**CE (N=2387)**	**Placebo (N=2465)**	**CE (N=1286)**	**Placebo (N=1291)**
Hip Fracture[b,96]						
Number of cases	5	1	9	20	32	52
Absolute risk (N)[c]	4	1	5	12	37	58
Hazard ratio (95% CI)	5.02 (0.59-43.02)		0.47 (0.22-1.04)		0.64 (0.41-0.99)	
Total Fractures[b,96]						
Number of cases	153	173	220	348	167	240
Absolute risk (N)[c]	126	139	132	201	191	269
Hazard ratio (95% CI)	0.90 (0.72-1.12)		0.63 (0.53-0.75)		0.70 (0.57-0.85)	
Overall Mortality[b 18,]						
Number of cases	34	48	129	131	134	113
Absolute risk (N)[c]	28	38	77	75	153	127
Hazard ratio (95% CI)	0.71 (0.46-1.11)		1.02 (0.80-1.30)		1.20 (0.93-1.55)	

[a] CHD defined as myocardial infarction or coronary death
[b] Based on adjudicated data over a mean duration of therapy of 7.1 years
[c] Absolute risk is per 10,000 person-years.
[d] VTE hazard ratios compared with women aged 50-59 taking placebo

Timing of the initiation of estrogen therapy relative to the start of menopause may affect the overall risk benefit profile. The WHI estrogen-alone substudy stratified by age showed in women 50-59 years of age, a non-significant trend towards reduced risk for CHD and overall mortality compared with placebo in women who initiated hormone therapy closer to menopause than those initiating therapy more distant from menopause.[18,100]

Women's Health Initiative Memory Study

The estrogen-alone Women's Health Initiative Memory Study (WHIMS), an ancillary study of WHI, enrolled 2,947 predominantly healthy hysterectomized postmenopausal women 65 years of age and older (45% were 65 to 69 years of age; 36% were 70 to 74 years of age; and 19 % were 75 years of age and older) to evaluate the effects of daily CE (0.625 mg) in the incidence of probable dementia (primary outcome) compared to placebo.

After an average follow-up of 5.2 years, the relative risk of probable dementia for CE-alone versus placebo was 1.49 (95% CI 0.83-2.66). The absolute risk of probable dementia for CE alone versus placebo was 37 versus 25 cases per 10,000 women-years. Probable dementia as defined in this study included Alzheimer's disease (AD), vascular dementia (VaD) and mixed types (having features of both AD and VaD). The most common classification of probable dementia in both the treatment and placebo groups was AD.[7] Since the substudy was conducted in women 65 to 79 years of age, it is unknown whether these findings apply to younger postmenopausal women (see section 4.4 Special Warnings and Precautions for Use, Dementia and section 5.1 Pharmacodynamic Properties, WHIM Study)[7].

5.2. PHARMACOKINETIC PROPERTIES

Absorption[100]
Conjugated estrogens are soluble in water and are well-absorbed from the gastrointestinal tract after release from the drug formulation. The CE tablet releases conjugated estrogens slowly over several hours. Maximum plasma concentrations are achieved approximately 6-10 hours following CE tablet administration. The estrogens are generally eliminated in near-parallel fashion, with half-lives ranging from 10-20 hours, when corrected for endogenous concentrations as needed.[97]

Distribution[100]
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 concentration in the sex hormone target organs. Estrogens circulate in the blood largely bound to sex hormone binding globulin (SHBG) and albumin.[98]

Metabolism[100]
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 proportion of the circulating estrogens exists as sulfate conjugates, especially estrone sulfate, which serves as a circulating reservoir for the formation of more active estrogens.[98]

Excretion
Estradiol, estrone, and estriol are excreted in the urine, along with glucuronide and sulfate conjugates.[99,100]

Special Populations
No pharmacokinetic studies were conducted in special populations, including patients with renal or hepatic impairment.[100]

6. PHARMACEUTICAL PARTICULARS

6.1. LIST OF EXCIPIENTS

Lactose Monohydrate (Spray Dried)
Microcrystalline Cellulose
Hypromellose 2208, K100M
Magnesium Stearate
Purified Water

Sucrose
Hydroxypropyl Cellulose
Hypromellose, 2910, E6
Hypromellose, 2910, E15
Polyethylene Glycol 400

Opadry

6.2. INCOMPATIBILITIES

Not Available

6.3. SHELF LIFE

36 months.

6.4. SPECIAL PRECAUTIONS FOR STORAGE

Store below 30°C.

6.5. NATURE AND CONTENTS OF CONTAINER

Alu-PVC Blister cards packed in unit carton.

Premarin/LPD-PK-04
According to CDS version 29 dated: April 15, 2015 supersedes CDS version 28 dated: May 30, 2014

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100 May 2014 Conjugated Estrogens 2.5 Clinical Overview for Non-Renewal (CDS_USPI_SPC)_ Conversion to Pfizer Template

101 March 2015 Conjugated Estrogens 2.5 Clinical Overview to support the update to section 5.1