



## Selective Estrogen Receptor Modulators (SERMS)

Selective estrogen receptor modulators (SERMS) are compounds that bind with estrogen receptors and exhibit estrogen action in some tissues and anti-estrogen action in other tissues. Today SERMs are used for the menopausal woman as an alternative to estrogen replacement and by infertile women for ovulation induction. For menopausal women, the ideal SERM would deliver all the benefits of estrogen without the adverse effects. Although SERMs may not be closely related chemically to the estrogen produced in a woman's body, people sometimes use the term "designer estrogen" to describe them. A few better-known SERMs are outlined below:

### Raloxifene (Marketed as Evista™)

- Primary Indication - FDA-approved for prevention and treatment of osteoporosis in postmenopausal women.
- Bone Effects - Increases bone density, although apparently to a lesser degree than estrogen or bisphosphonates (Fosamax™, Actonel™). Raloxifene reduces the risk of fractures in women with a history of osteoporosis.
- Breast Effects - Does not appear to harm the breast or increase the risk of breast cancer. One study has shown an association with raloxifene and a lower risk of breast cancer in average-risk women. Studies are ongoing to determine if raloxifene reduces the risk of breast cancer in high-risk women.
- Cardiovascular Effects - Decreases total cholesterol and low-density cholesterol ("bad cholesterol"). Raloxifene has no effect on high-density cholesterol ("good cholesterol") and triglycerides.
- Venous Thrombosis - Like estrogen, raloxifene increases risk of deep venous thrombosis (blood clots).
- Menopausal Symptoms - Does not relieve vasomotor flushes. In fact, they are a common side effect. Raloxifene does not relieve vaginal dryness.

### Phytoestrogens

Phytoestrogens are plant-derived compounds with estrogen-like activity. These are over-the-counter medications. Phytoestrogens are found in foods such as soy beans, tofu, miso, and soy milk. Commercial soy products have been processed to appeal to the American consumer and are sold as protein powder extracts, cereals, energy bars, and tablets. These supplements are not standardized or regulated by the FDA, and no information regarding phytoestrogen content is required on product labels. Since scientific studies using commercially available products are limited, it is difficult to make definitive recommendations.

- Bone Effects - Not been found to reduce fractures.
- Breast Effects - No evidence of favorable or unfavorable effects on the breast.
- Cardiovascular Effects - May reduce low-density cholesterol ("bad cholesterol").

- Venous Thrombosis - Effects are unknown.
- Menopausal Symptoms - Do not relieve vaginal dryness. They may reduce vasomotor flushes.

### **Tamoxifen** (Marketed as Nolvadex™)

- Primary Indication - Tamoxifen is FDA-approved for treatment of breast cancer and to reduce the incidence of breast cancer in high-risk women.
- Bone Effects - Appears to reduce bone loss in postmenopausal women.
- Breast Effects - See Primary Indication above.
- Cardiovascular Effects - Lowers total cholesterol and LDL cholesterol and has no effect on HDL cholesterol.
- Venous Thrombosis - Increases the risk of blood clots.
- Menopausal Symptoms - Does not treat and may cause vasomotor flushes.
- Uterine Effects - Associated with abnormal growth of the uterine lining (endometrium) and a small increased risk of endometrial cancer and polyps.

### **Clomiphene Citrate** (Marketed as Clomid™ or Serophene™)

- Primary Indication - FDA-approved for induction of ovulation.
- Side Effects - Increases the risk of multiple gestations and may be associated with ovarian cyst formation, hot flashes, visual changes, decreased cervical mucus production, and thin uterine lining. Long-term use (greater than 12 treatment cycles) may be associated with a slight increased risk of ovarian cancer.

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