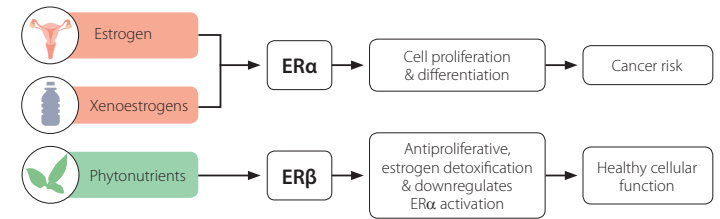


### Estrogen metabolism and nutritional influences

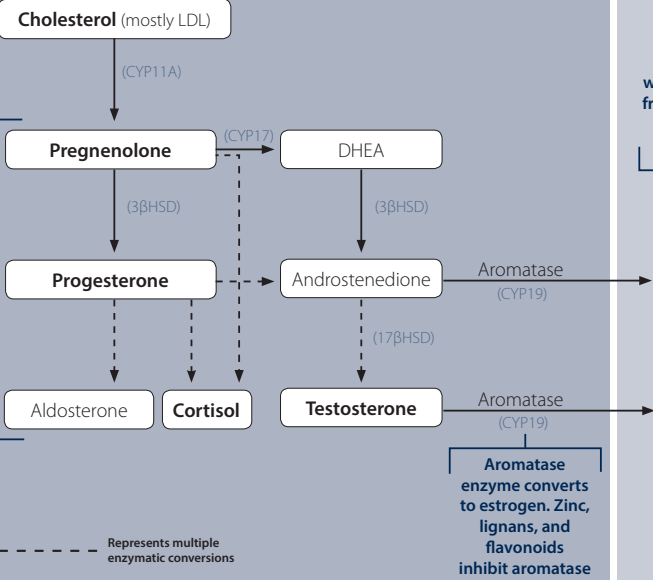
Estrogen is the primary hormone responsible for sexual and reproductive development in women. Once puberty begins, the body uses estrogen to regulate the first half of the menstrual cycle and then metabolises the hormone for elimination. Dietary and lifestyle modifications that support a healthy weight, like consuming a nutrient-dense dietary pattern (e.g., increasing intake and being physically active), have been linked to the modulation of estrogen metabolism. In addition, many nutrients and nutritional bioactives have been studied for their influence on pathways of estrogen metabolism and detoxification.

### Estrogens & estrogen receptor sensitivity

Endogenous estrogens, environmental xenoestrogens, and their metabolites selectively bind to estrogen receptors. Various phytonutrients, such as phytoestrogens (lignans, isoflavones) and ErR 731 (a non-hormonal selective ERB agonist), may moderate their binding, and modulate cell signaling to support hormone balance.

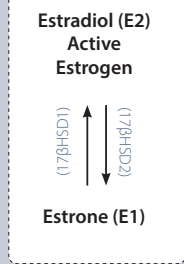


#### Production and conversion of estrogen

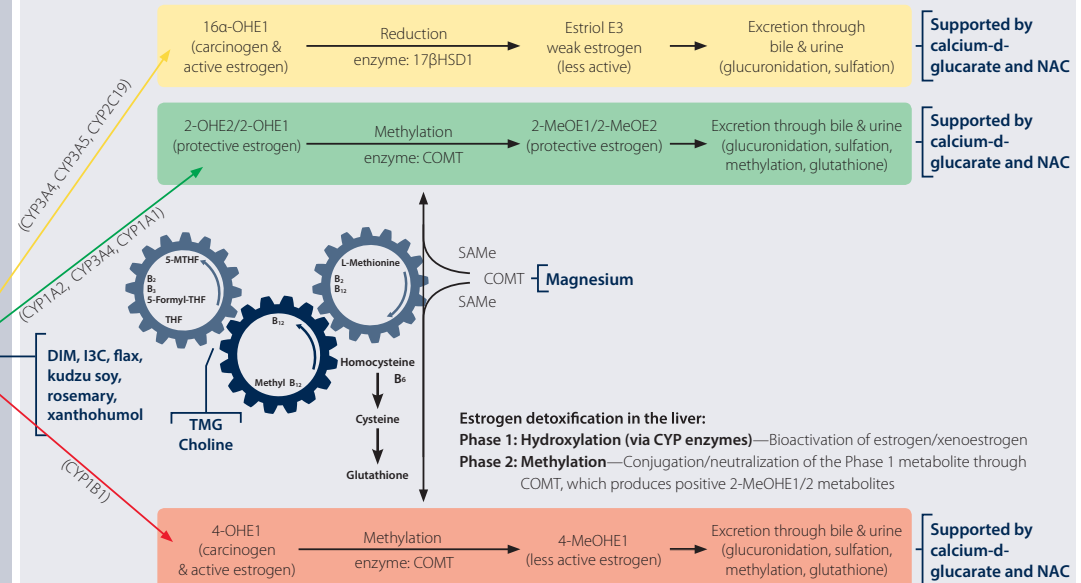


#### The body's systemic pool of estrogen

Lignans & isoflavones help regulate production of SHBG, which assists in the regulation of free estrogens, testosterone, and di-hydrotestosterone in circulation



#### Estrogen detoxification: bioactivation, conjugation, and elimination



#### Estrobolome—gut & estrogen connection

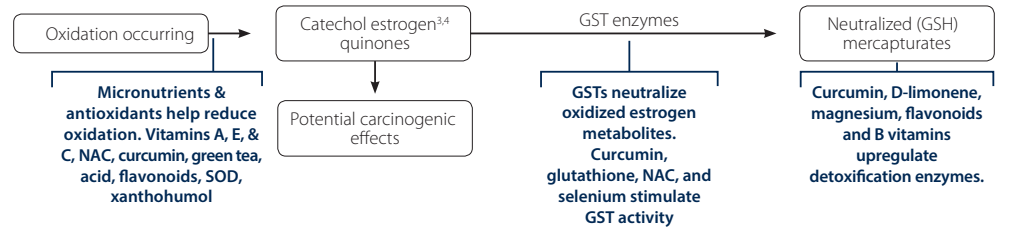
The gut plays a vital role in the body's ability to clear unwanted estrogen metabolites. Gut dysbiosis can contribute to β-glucuronidase activity, which allows estrogen to re-enter circulation and increase the estrogen pool, leading to unbalanced hormones. Proper gut health, nutrition, and the types and amounts of macronutrients support estrogen biotransformation and clearance.

- 5R gut protocol, probiotics, prebiotics, fibre (apple pectin)**
- β-glucuronidase inhibitors: probiotic strain *L. acidophilus* NCFM®, calcium D-glucarate; lignans**
- Flax lignans support excretion**



#### Liver & estrogen detoxification

Balancing Phase I and Phase II enzyme systems in the liver supports healthy estrogen detoxification and encourages the clearance of genotoxic 4-OHE1 metabolites through the induction of Nrf2, quinone reductase (NQO1), GSTs,\* and GSH.



**KEY:** CLA: conjugated linoleic acid; COMT: catechol-O-methyltransferase; DHEA: dehydroepiandrosterone; 5-formyl-THF: 5-formyltetrahydrofolate; HRT: hormone replacement therapy; 5-MTHF: 5-methyltetrahydrofolate; NAC: N-acetylcysteine; SAME: S-adenosylmethionine; SAH: S-adenosylhomocysteine; SHBG: sex hormone-binding globulin; THF: tetrahydrofolate; TMG: trimethylglycine; Nrf2: nuclear factor erythroid 2 (NF-E2) p45-related factor 2; NQO1: NAD(P)H:quinone oxidoreductase 1; GST: glutathione S-transferase; GSH: reduced glutathione; 2-OHE1: 2-hydroxyestrogen; 2-OHE2: 2-hydroxyestradiol; 2-MeOE1: 2-methoxyestrogen; 2-MeOE2: 2-methoxyestradiol; 4-OHE1: 4-hydroxyestrogen; 4-MeOE1: 4-methoxyestrogen; 16α-OHE1: 16α-hydroxyestrogen

\*GSTs: glutathione S-transferases are important enzymes of detoxification and intra-cellular binding proteins

## Estrogen Metabolism

Product	Key Actives	Rationale/MOA	Conditions, signs and symptoms
<b>Foundation Support</b>			
Mag Glycinate	<ul style="list-style-type: none"> <li>Magnesium glycinate</li> </ul>	<ul style="list-style-type: none"> <li>Magnesium is involved in the detoxification of estrogens by upregulating detoxification enzymes</li> </ul>	Muscle cramping, anxiety, restless leg syndrome
PhytoMulti	<ul style="list-style-type: none"> <li>Vitamins A, C, E</li> <li>B Vitamins</li> <li>Magnesium</li> <li>Zinc</li> <li>Selenium</li> <li>Chromium</li> <li>Proprietary Phytonutrient Blend (cinnamon, green tea, flavonoids)</li> <li>Myo-Inositol</li> <li>Lycopene</li> </ul>	<ul style="list-style-type: none"> <li>Increasing insulin sensitivity supports hormone metabolism (chromium, myo-Inositol, cinnamon)</li> <li>Aromatase enzyme converts substrates to estrogen. Zinc, and flavonoids inhibit aromatase</li> <li>Micronutrients &amp; nutritional bioactives with antioxidant properties help reduce oxidation: vitamins A, E, &amp; C, green tea, lycopene and flavonoids</li> <li>GSTs neutralize oxidized estrogen metabolites. Selenium stimulates GST activity</li> <li>Magnesium, flavonoids, and B vitamins are involved in the detoxification of estrogens by upregulating detoxification enzymes</li> </ul>	Symptoms of poor micronutrient status such as fatigue, lack of concentration, and low immunity
UltraFlora Balance	<ul style="list-style-type: none"> <li><i>L. acidophilus</i> NCFM®</li> <li><i>B. lactis</i> Bi-07®</li> </ul>	<ul style="list-style-type: none"> <li>β-glucuronidase inhibitor: probiotic strain <i>L. acidophilus</i> NCFM®</li> </ul>	Gut dysfunction: bloating, flatulence, constipation, diarrhoea
<b>Blood Sugar Support</b>			
Cenitol	<ul style="list-style-type: none"> <li>Magnesium glycinate</li> <li>Myo-Inositol</li> </ul>	<ul style="list-style-type: none"> <li>Increasing insulin sensitivity supports hormone metabolism</li> <li>Magnesium is involved in the detoxification of estrogen by upregulating detoxification enzymes</li> </ul>	Symptoms of blood sugar dysregulation such as fatigue, weight around the middle, sugar cravings
Meta Lipoate 300	<ul style="list-style-type: none"> <li>Alpha-Lipoic Acid</li> </ul>	<ul style="list-style-type: none"> <li>Increasing insulin sensitivity supports hormone metabolism</li> <li>ALA plays a role in the regulation of glucose metabolism, insulin sensitivity, insulin secretion, the reduction of circulating lipid levels and the increase of nitric oxygen.</li> </ul>	
MetaGlycemX	<ul style="list-style-type: none"> <li>Vitamin C, D, E</li> <li>B Vitamins</li> <li>Zinc</li> <li>Selenium</li> <li>Chromium</li> <li>Cinnamon</li> <li>Decaffeinated Green Tea Leaf Extract</li> <li>Alpha-Lipoic Acid</li> </ul>	<ul style="list-style-type: none"> <li>Increasing insulin sensitivity supports hormone metabolism</li> <li>Aromatase enzyme converts substrates to estrogen. Zinc inhibits aromatase</li> <li>Micronutrients &amp; nutritional bioactives with antioxidant properties help reduce oxidation: vitamins E, &amp; C, green tea, α-lipoic acid</li> <li>GSTs neutralize oxidized estrogen metabolites. Selenium stimulates GST activity</li> <li>B vitamins are involved in the detoxification of estrogens by upregulating detoxification enzymes</li> </ul>	

## Detoxification Support

GlutaClear	<ul style="list-style-type: none"> <li>Vitamin C</li> <li>Niacin</li> <li>Selenium</li> <li>NAC</li> <li>Broccoli Seed Extract</li> </ul>	<ul style="list-style-type: none"> <li>NAC supports excretion of estrogen metabolites</li> <li>Micronutrients &amp; nutritional bioactives with antioxidant properties help reduce oxidation: vitamins C and NAC</li> <li>GSTs neutralize oxidized estrogen metabolites. NAC and selenium stimulate GST activity</li> <li>B vitamins are involved in the detoxification of estrogens by upregulating detoxification enzymes</li> </ul>	Symptoms of compromised detoxification pathways such as fatigue, sluggish metabolism, breakouts and headaches
Methyl Care	<ul style="list-style-type: none"> <li>Riboflavin</li> <li>Vitamin B6</li> <li>Folate</li> <li>Vitamin B12</li> <li>Zinc</li> <li>NAC</li> </ul>	<ul style="list-style-type: none"> <li>NAC supports excretion of estrogen metabolites</li> <li>Aromatase enzyme converts substrates to estrogen. Zinc inhibits aromatase</li> <li>Micronutrients &amp; nutritional bioactives with antioxidant properties help reduce oxidation: N-acetylcysteine</li> <li>GSTs neutralize oxidized estrogen metabolites. NAC stimulates GST activity</li> <li>B vitamins are involved in the detoxification of estrogens by upregulating detoxification enzymes</li> </ul>	Estrogen dominance: PMS, mood fluctuations, breast tenderness, irregular menstrual periods
SulforaClear	<ul style="list-style-type: none"> <li>Broccoli Sprout and Floret Powder (with active myrosinase)</li> <li>Broccoli Seed Extract (providing 10mg glucoraphanin)</li> </ul>	<ul style="list-style-type: none"> <li>Aromatase enzyme converts substrates to estrogen. Flavonoids inhibit aromatase</li> <li>Micronutrients &amp; nutritional bioactives with antioxidant properties help reduce oxidation: flavonoids</li> <li>Sulforaphane supports phase 2 detoxification and provides antioxidant support, mopping up damaging free radicals produced by the detoxification process</li> </ul>	Symptoms of compromised detoxification pathways such as fatigue, sluggish metabolism, breakouts and headaches

## Hormonal Support

EstroFactors	<ul style="list-style-type: none"> <li>B Vitamins</li> <li>Rice Protein Matrix and Polyphenols from Hops</li> <li>Diindolylmethane (DIM)</li> <li>Decaffeinated Green Tea Leaf Extract</li> <li>NAC</li> <li>HMLLignan™</li> <li>Proprietary Mix of Curcumin and Fenugreek Galactomannans</li> <li>Mixed Carotenoids</li> </ul>	<ul style="list-style-type: none"> <li>Aromatase enzyme converts substrates to estrogen. Zinc, lignans (flax), and flavonoids inhibit aromatase</li> <li>Lignans help regulate production of SHBG, which assists in the regulation of free estrogens, testosterone, and dihydrotestosterone in circulation</li> <li>DIM and Xanthohumol enhance the production of 'good' 2"OHE Estrogen over 4'OHE and 16'OHE</li> <li>NAC supports excretion of estrogen metabolites</li> <li>Micronutrients &amp; nutritional bioactives with antioxidant properties help reduce oxidation: vitamins A, E, &amp; C, NAC, curcumin, green tea, flavonoids and xanthohumol</li> <li>GSTs neutralize oxidized estrogen metabolites. Curcumin, NAC and selenium stimulate GST activity</li> <li>Flax lignans support estrogen excretion from the gut</li> </ul>	Estrogen Dominance: PMS, mood fluctuations, breast tenderness, irregular menstrual periods
Estrovera	<ul style="list-style-type: none"> <li>ErR 731 (Siberian Rhubarb extract)</li> </ul>	<ul style="list-style-type: none"> <li>Estrogen receptors (ER) are present in both men and women. Endogenous estrogens, environmental xenoestrogens, and their metabolites selectively bind to estrogen receptors</li> <li>Various phytonutrients, such as ErR 731, may moderate their binding, modulating cell signaling to support hormone balance</li> </ul>	Low estrogen levels. Hot flashes, night sweats, vaginal dryness, amenorrhoea
Meta I3C	<ul style="list-style-type: none"> <li>Indole-3-carbinol</li> </ul>	<ul style="list-style-type: none"> <li>Indole-3-carbinol, enhances the production of 'good' 2"OHE Estrogen over 4'OHE and 16'OHE</li> </ul>	Estrogen Dominance: PMS, mood fluctuations, breast tenderness, irregular menstrual periods