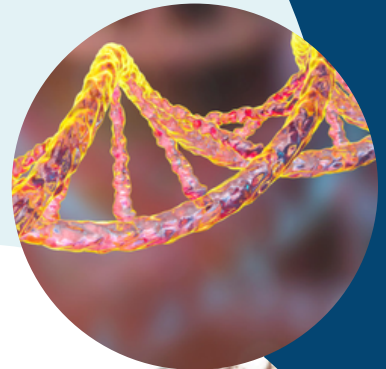




# The Role of Detoxification in Supporting Female Athletes

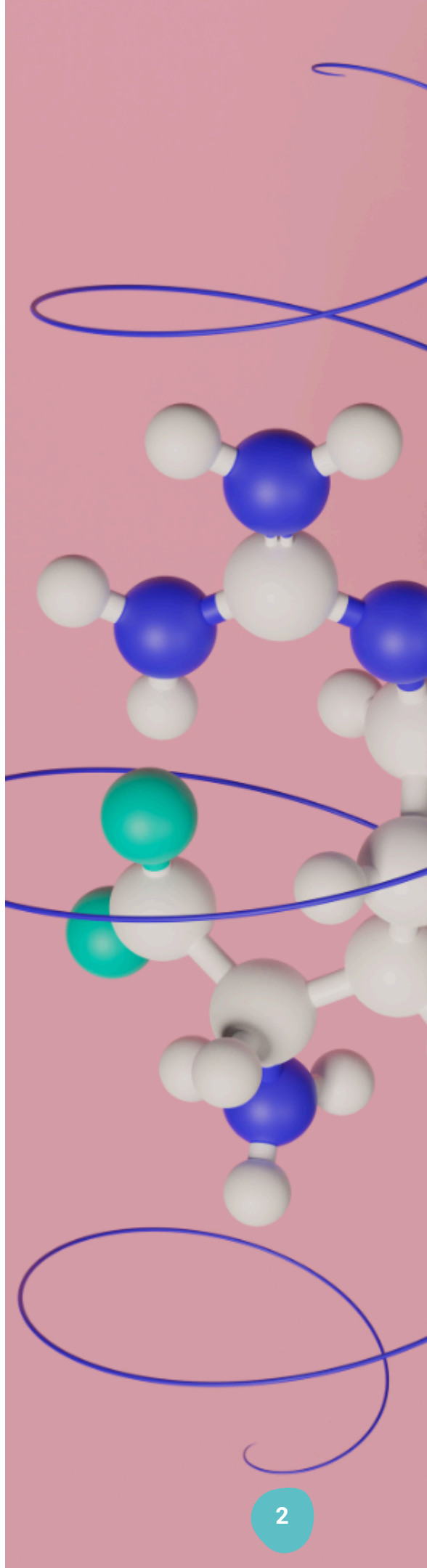
By Dr. Chris Latham, DCN, CNS

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# Table of Contents

<b>Hormonal Differences and Athletic Performance</b>	<b>3</b>
<b>The Importance of Detoxification for Female Athletes</b>	<b>3</b>
<b>Phase I Liver Detoxification</b>	<b>3</b>
<b>Phase II Liver Detoxification</b>	<b>4</b>
<b>The Impact of Xenoestrogens</b>	<b>4</b>
<b>Estrogen Metabolism and Detoxification</b>	<b>5</b>
<b>The Role of Detoxification Genes</b>	<b>5</b>
<b>Testing for Detoxification Genes</b>	<b>6</b>
<b>The Role of Nutrition in Detoxification</b>	<b>6</b>
<b>Estrogen-Balancing Diet Recommendations</b>	<b>6</b>
<b>Case Study: Addressing Detoxification in a Female Athlete</b>	<b>7</b>
<b>Conclusion</b>	<b>8</b>
<b>About the Author</b>	<b>8</b>
<b>Additional Resources &amp; References</b>	<b>9</b>
<b>Be a Healthcare Pioneer</b>	<b>9</b>



## Introduction

Female sports have grown in popularity over the last several decades. With this growth, females have increased training and competition, but the lack of sports science studies focused on women leave their specific needs and detoxification requirements unrecognized —since 1993 and the passage of the NIH Revitalization Act, a mere 6% of studies focused on females<sup>5</sup>.

This guide explores the unique detoxification challenges female athletes face, focusing particularly on the liver's role in maintaining optimal performance. We'll dive into the liver's two primary detoxification phases, key nutrients required to support these processes, and how to optimize detoxification pathways through targeted nutrition.

## Hormonal Differences and Athletic Performance

When it comes to sports, female athletes are dramatically different than males. They have a diversity of stressors placed on their bodies during exercise, which men do not, largely due to hormonal differences. Female hormones can disrupt their natural balance and lead to an increase or decrease in menstrual functioning and symptoms. Apart from reproduction, hormones related to menstruation have significant effects on the body, including thermoregulation, fluid regulation, cardiovascular function, sleep, weight gain, cognitive ability, metabolic response, and respiratory function.<sup>11</sup> Any one of these can impact athletic performance.<sup>3 4</sup>

## The Importance of Detoxification for Female Athletes

Detoxification is vital for all people, but female athletes must pay special attention to this process due to the impact of hormonal fluctuations.

Five specific detoxification pathways are utilized during athletics: the integumentary (skin), urinary, respiratory, lymphatic, and digestive (including the liver). Each pathway acts in a specific manner to pull toxins from the body. This article will focus on the liver, the largest gland in the human body, and its role in detoxification.

## Phase I Liver Detoxification

Phase I liver detoxification involves the cytochrome P450 (CYP450) enzyme, which metabolizes xenobiotics, hormones, and pharmaceuticals into more reactive forms. The liver does this by way of oxidation, hydrolysis, or reduction, making the metabolites ready for phase II detoxification. Phase I can cause oxidative damage; thus, antioxidants are important during this phase.<sup>7</sup>



## Nutrients Supporting Phase I Detoxification

In phase I, B vitamins and antioxidants are essential. Nutrients needed to support phase I detoxification include vitamin B2, B3, B6, folate, B12, glutathione, branched-chain amino acids, flavonoids, and phospholipids.

Antioxidants needed to neutralize reactive oxygen species produced in phase I include vitamin A, C, E, selenium, copper, zinc, manganese, CoQ10, thiols, bioflavonoids, silymarin, and pycnogenol.

The **Vibrant Micronutrient Panel** can be used to assess direct measurement of both intra- and extracellular nutrient status of these and other essential vitamins, minerals, co-factors, amino acids, and essential fatty acids.



Vibrant's Micronutrient Panel

## Phase II Liver Detoxification

Phase II liver detoxification, also known as the conjugation phase, requires amino acids. The liver attaches water-soluble molecules to the phase II metabolites, neutralizing the metabolites and making them hydrophilic. By doing so, the neutralized metabolites can be excreted from the body.<sup>7</sup>

## Nutrients Supporting Phase II Detoxification

Specific compounds used in phase II include glucuronic acid, sulfate, amino acids, acetyl group, methyl group, and glutathione.<sup>12</sup> Nutrients needed to support phase II detoxification include amino acids such as cysteine, glycine, taurine, glutamine, ornithine, arginine, N-acetylcysteine, and methionine.

## The Impact of Xenoestrogens

Minimizing contact with endocrine disruptors, such as xenoestrogens, can decrease estrogen levels since they have the ability to mimic natural estrogens. These substances (parabens, phthalates, nitro musks, benzophenones, bisphenol A, pesticides, and fire retardants) can be found in pesticides, cosmetics, plastics, plants, industrial byproducts, fumes, metals, and medications. There are both natural and synthetic xenoestrogens. Xenoestrogens exert their effect by binding to estrogen receptors on the cell, leading to a buildup of estrogen.

Xenoestrogens, which are not similar to the structure of estrogen, can affect the function of estrogen in other ways. The buildup of estrogen caused by xenoestrogens can lead to estrogen dominance as well as hormone-dependent cancers, including breast, ovarian, endometrial, prostate, thyroid, and cervical.<sup>15</sup>

# Estrogen Metabolism and Detoxification

If detoxification pathways are impaired, estrogen dominance can follow. Estrogen dominance results from increased levels of estrogen relative to progesterone in the body. Estrogen dominance can cause<sup>6</sup>:

- Heavy menstruation
- Painful periods
- PMS
- Headaches
- Sleep disturbances
- Breast tenderness
- Bloating
- Mood swings
- Fatigue, anxiety
- Depression
- Weight gain

Risk factors for estrogen dominance include<sup>15</sup>:

- Poor dietary choices (low-fiber, hormone-rich, high-glycemic foods)
- Stress
- High alcohol consumption
- Sugar dysregulation
- Excess body fat
- Xenoestrogens
- Hormone replacement therapy
- Birth control
- Gut dysbiosis

## The Role of Detoxification Genes

Detoxification genes such as CYP1A1, CYP1A2, CYP1B1, and COMT are involved in the process of estrogen metabolism. CYP1B1 is a phase I detoxification enzyme; a SNP in this gene has been linked to lower enzyme activity,<sup>1</sup> resulting in increased toxins and oxidative damage. CYP1A2, also a phase I detoxification enzyme, clears toxins from the body. A decrease in this enzyme results in a decreased clearance of toxins/xenobiotics. CYP1A1, again a phase I detoxification enzyme, is critical for estrogen synthesis. A malfunction of this gene can lead to excess estrogen, resulting in estrogen dominance. Catechol O-methyltransferase (COMT), a phase II detoxification enzyme, is involved in the metabolism of xenobiotics, catecholamines, and estrogens. A decrease in this enzyme impairs estrogen metabolism.<sup>14</sup>

## The COMT Enzyme and Its Importance in Detoxification

One of the main Phase II detoxification enzymes for metabolizing estrogen and xenobiotics is Catechol O-methyltransferase (COMT). COMT is found in various tissues, such as the endometrium and breast tissue, and is involved in the metabolism of xenobiotics, catecholamines, and estrogens, thereby inactivating them.<sup>8</sup>

Magnesium is the cofactor needed for the COMT enzyme to function and clear estrogen from the liver. A magnesium deficiency can increase serum estrogen and lead to estrogen dominance.<sup>9</sup> If the client is female and has COMT SNPs, limiting green tea and potatoes due to the catechol content before their menstrual cycle could be beneficial.

## Genetic Variants and Their Impact on Estrogen Metabolism

Determining if a female carries a COMT SNP is crucial, particularly the rs4680 variant (A allele), which reduces enzyme activity by 40% compared to the G allele. Individuals with the A allele have a diminished capacity to break down neurotransmitters, estrogen, and xenobiotics, leading to impaired estrogen metabolism. Moreover, women with the AA genotype may face a heightened risk of breast cancer when exposed to xenoestrogens.<sup>1</sup>

## Testing for Detoxification Genes

You can test for genetic mutations in detoxification genes using the Toxin Genetics test by Vibrant Wellness. The panel identifies 23 common SNPs involved in both Phase I and Phase II detoxification processes, along with genetics specific to various toxins. This comprehensive analysis provides valuable insights into an individual's detoxing ability, allowing for personalized detox strategies.



[Vibrant's Toxin Genetics Test](#)

## The Role of Nutrition in Detoxification

Nutrition also plays a major role in detoxification. Athletes who have impaired nutrient intake, unsupportive dietary patterns, increased toxic loads, and high oxidative stress are potentially at risk for detoxification issues. Supporting the detoxification pathways through proper intake of antioxidants, amino acids, fatty acids, and key phytonutrients should be part of any athlete's fueling program.

## Estrogen-Balancing Diet Recommendations

Overall, following an estrogen-balancing diet that limits alcohol, contains a low intake of animal products (conventional dairy and red meat may contain estrogen), and grapefruit (inhibits cytochrome P4503A4 enzyme) would be recommended. A Mediterranean-type diet could be beneficial for those with estrogen dominance.<sup>17</sup> In addition, if the client is female and has COMT SNPs, limiting green tea and potatoes due to the catechol content before their menstrual cycle would be beneficial.

### Cruciferous Vegetables

Cruciferous vegetables, such as cabbage, broccoli, cauliflower, and brussels sprouts can upregulate the activity of the CYP1B1 and CYP1A1 enzymes, which break down estrogen metabolites. Cruciferous vegetables contain the compounds indole-3-carbinol (I3C, a natural anti-estrogen), glucosinolates, and sulforaphane.<sup>11</sup> I3C works on the Phase I detox pathway, while sulforaphane works on the phase II detox pathway; glucosinolates become sulforaphane in the intestines. Thus, cruciferous vegetables upregulate CYP1B1 and CYP1A1 to clear estrogen from the body, thereby decreasing free radicals and cellular damage.<sup>7</sup>

## Fiber

Eating a fiber-rich diet can decrease estrogen levels by binding to circulating estrogens and removing them from the body via stool. Fiber decreases the amount of estrogen absorbed and increases the amount of estrogen excreted via the enzyme  $\beta$ -glucuronidase. This enzyme can reactivate deconjugated estrogen in the gut.<sup>18</sup> When this happens, estrogen is then reabsorbed, which increases circulating estrogen. Both soluble and insoluble fiber can decrease serum estrogen concentrations.

## Case Study: Addressing Detoxification in a Female Athlete

A female athlete, 47 years old, came to me for low energy, PMS, and a past history of endometriosis. She is 5'5 and weighs 145 lbs. She works as an engineer and makes acrylic tokens on the side.

Her history includes heavy periods in high school and endometriosis and anemia as an adult. She took birth control in her early 20s. She had two surgeries in her late 20s and early 30s for endometriosis. She considers herself vegan but eats eggs and is gluten-free. She suffers from belching and gas and gets bloated after eating wheat, bleached flour, or sugar.

She is a top-level cyclist and plays soccer. Her exercise schedule is below:

- Stretching/Yoga: 1-2 days/week for 30 minutes.
- Cycling and soccer 3-4 days/week (~10-12 hours total per week)
- Strength Training: 2-3 days/week for 90 mins
- Active Lifestyle: 2-3 days/week, 30 minutes to several hours.

In order to get a better idea of how she ate, I've included a one-day food journal.

- Breakfast: Macro Bar and water
- Lunch: 2 poached eggs with greens, fresh green juice
- Snack: Macro Bar and water
- Dinner: Salad with kale, mixed lettuce, blueberries, hemp, seeds, and water
- Snack: Crepe with berries and water

Upon reviewing her one-day food journal, you can see that she is considerably low in protein/amino acids, fiber, omega 3s, antioxidants, as well as numerous vitamins and minerals.

Based on her symptoms and food diary, I recommended the [Vibrant Wellness Micronutrient Panel](#). The results from the test found that she was low in B vitamins, antioxidants, omega 3s, and amino acids/protein. All of these nutrients are needed for proper detoxification.

Recommendations:

- Emphasize meals to include real food, including a focus on increasing fiber and color to balance the microbiome and aid in detoxification, particularly cruciferous vegetables.
- Increase water intake to aid in detoxification.
- Increase total protein intake – dosed around training and at meals – to support Phase II liver detoxification.
- Supplements include omega 3s, probiotics, magnesium, and Vitex. Each supplement will support detoxification and decrease inflammation. The Vitex will help balance hormones to reduce the load on the liver by decreasing estrogen metabolites.<sup>13</sup>
- Post-exercise sport stack: protein powder, creatine, collagen.

After treating this patient and addressing her underlying imbalances via the above recommendations, her energy increased, her periods became regular, her PMS decreased, and her digestion normalized.

## Conclusion

Estrogen metabolism, the gut microbiome, and detoxification are closely interconnected. The gut microbiome significantly influences estrogen metabolism through the enzyme  $\beta$ -glucuronidase. However, when gut health is compromised by dysbiosis, this process can become disrupted, potentially leading to conditions like estrogen dominance, endometriosis, fibroids, and PCOS.

Microbiome testing like the **Vibrant Wellness Gut Zoomer** is a valuable tool for assessing estrogen dominance by measuring the enzyme  $\beta$ -glucuronidase, a marker of excess estrogen,<sup>2</sup> as well as for detecting dysbiosis.

Balancing hormones is not just about giving the body more hormones. It's about addressing the entire estrogen-gut-liver axis and replenishing the nutrients that are needed for these systems to work. The above case study shows how important addressing the entire estrogen-gut-liver axis is to detoxification in the female athlete.

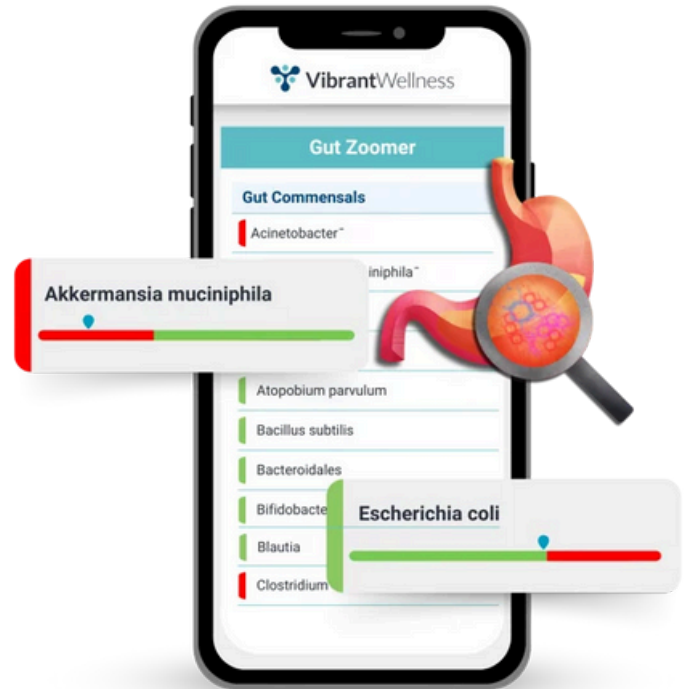
## About the Author

Dr. Chris Latham, a former elite triathlete and Doctor of Clinical Nutrition, is the founder of **Heal Well Nutrition**, a renowned clinical and functional nutrition practice based in Santa Barbara, CA. She specializes in empowering athletic women over 40 to thrive in their sports by addressing fatigue and bloating through personalized nutrition and lifestyle strategies that naturally boost energy and optimize digestion.

A published researcher and recognized expert, Dr. Latham has been featured on FOX News, contributed to numerous online publications, presented at international nutrition conferences, and served on the White House Advisory Panel for Nutrition.



[Heal Well Nutrition Website](#)



[Vibrant's Gut Zoomer](#)





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