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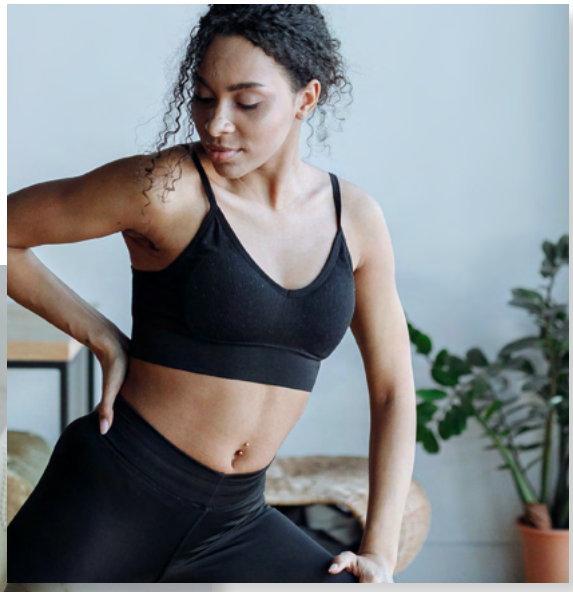

PCOS Support Guide

Patient Guide

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What is PCOS?

Statistics, signs, symptoms, and diagnosis

Polycystic ovary syndrome (PCOS) is a common hormonal condition that affects teenage girls and women of childbearing age. It is estimated that it affects 6-12 percent of the U.S. female population, with a wider range worldwide – 4-20 percent. One reason it is difficult to pinpoint the prevalence of PCOS more accurately is that it is estimated that at least half the girls and women who have PCOS don't know they have it.

Although PCOS is normally diagnosed when a girl reaches puberty, it might not be recognized until later, when a woman has unexplained weight gain or difficulty becoming pregnant. PCOS can have an adverse impact on the overall health and appearance of a woman. Although menstrual irregularities and infertility place the diagnostic and treatment focus on women of childbearing age, PCOS can be a lifelong problem, affecting both menopausal and postmenopausal women with metabolic issues, such as cardiovascular disease and diabetes.

A diagnosis of PCOS requires at least two of the following three signs or symptoms:

- Infrequent, irregular, or prolonged menstrual cycles. This can range from fewer than nine periods a year to more than 35 days between periods to abnormally heavy periods.
- A high testosterone level that can manifest as excess facial and body hair (hirsutism), acne (sometimes severe), and/or male-pattern baldness.
- Ovarian cysts caused by the ovaries not forming eggs properly or not releasing eggs during ovulation, causing fluid-filled sacs (the cysts), which can lead to fertility problems.

Between 50-80 percent of PCOS patients are also overweight. Other less common symptoms include darkening of the skin in the folds of the neck, groin, or under the breasts, and skin tags in armpits or on the neck.

Causes of PCOS

There doesn't appear to be one specific cause of PCOS; rather, there are several contributing factors – and in some cases, it's the old chicken or egg conundrum – cause or effect?

Overweight. It is estimated that between 50-80 percent of women who have PCOS are overweight or obese. Fat cells or adipocytes release a variety of fatty acids, hormones, and inflammatory chemicals that can interfere with insulin signaling and result in insulin resistance.

Insulin resistance. Insulin resistance (IR) is a common occurrence in women who have PCOS, and it likely contributes to its development. IR is the inability of insulin to do its job properly. Although the pancreas secretes insulin, the insulin isn't able to bind to receptors on cells and usher sugar from the bloodstream into the cells. This results in the body secreting more insulin to compensate – the result: increased insulin and blood sugar.

Hormone imbalance. Although testosterone is often thought of as a male hormone, women also need smaller amounts of testosterone to maintain good health. Insulin resistance can cause the ovaries to produce too much testosterone, which can then interfere with the development of ovarian follicles (the sacs where eggs develop) and prevent ovulation. This in turn results in the characteristic ovarian cysts seen in PCOS. Elevated testosterone also contributes to many other characteristic signs of PCOS, such as male-pattern baldness, excess facial/body hair, and acne. Other androgen hormones can be elevated too – such as DHEA, a precursor to testosterone.

Inflammation. Chronic inflammation can contribute to PCOS, and being overweight or obese contributes to general inflammation in the body because fat cells secrete inflammatory chemicals called cytokines (although one can have chronic inflammation, even if they aren't overweight). Like insulin resistance, too much inflammation can cause the ovaries to produce testosterone. Some of the inflammatory markers elevated in women with PCOS include C-reactive protein (CRP), tumor necrosis factor-alpha (TNF-α), and interleukin (IL)-18 (see The Inflammation Connection section).

Environment. Exposure to environmental pollutants can contribute to increased PCOS risk. For example, women who have PCOS can have higher blood levels of endocrine disruptors like bisphenol-A (BPA; used in plastic manufacturing) than other women.[1] Higher levels of other environmental toxins have also been found in women with PCOS: pesticides, fluorinated hydrocarbons (used in non-stick cookware, for example), polybrominated diphenyl ethers and polybrominated biphenyls (used in flame retardants), and polychlorinated biphenyls (PCBs) – potent carcinogens that collects in fat tissue. Although PCB use in manufacturing was banned in the United States in 1979 and worldwide in 2001 by the Stockholm Convention, PCBs remain a significant environmental pollutant because they can persist for longer than 100 years.[2,3]

Genetics. Genes likely play a part in a woman's risk for developing PCOS. A woman whose mother has PCOS is five times as likely to develop it herself.

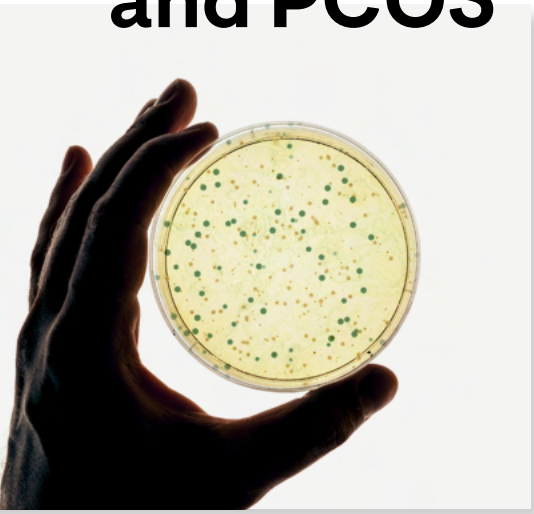
Microbiome. Disordered vaginal and gut microbiomes can contribute to PCOS (see Relationship between the Gut Microbiome and PCOS section).

Conditions associated with PCOS

A woman who has PCOS is at higher risk for other health concerns – and, in some cases, it's difficult to determine whether the condition is a result of or a cause of PCOS. Associated conditions include:

- **Infertility.** Women with PCOS have 15 times the risk of infertility than women without PCOS. Although infertility is often the reason a woman seeks medical advice, there are numerous other associated conditions.
- **Difficulty managing weight.** Excess weight can be a cause or an effect of PCOS. Sometimes PCOS symptoms don't manifest until a woman gains significant weight. On the other hand, women with PCOS tend to gain weight easily. The extra weight can contribute to other health issues.
- **Metabolic syndrome.** Many aspects of metabolic syndrome are also seen in women with PCOS – including insulin resistance, obesity in some cases, and elevated cholesterol.
- **Diabetes.** Statistics indicate that approximately 30 percent of women who have PCOS have impaired glucose tolerance, while an additional eight percent have diabetes.
- **Inflammation.** Evidence suggests low-grade inflammation causes the ovaries to produce excess androgens (testosterone and its precursors).
- **Cardiovascular disease.** Excess androgen hormones and being overweight can increase the risk for chronic diseases of the heart and blood vessels.
- **Sleep apnea.** In one study, women who had PCOS were 30 times more likely to suffer from disordered breathing when sleeping – sleep apnea – than women who didn't have PCOS.
- **Fatty liver.** Numerous clinical studies point to the increased prevalence of non-alcoholic fatty liver disease (NAFLD) in women who have PCOS, independent of weight or other metabolic syndrome factors.
- **Eating disorders/disordered eating.** Women who have PCOS are more likely to experience food cravings, poor impulse control around eating, and increased appetite. Eating disorders, particularly binge eating/ bulimia are also more common in women with PCOS.
- **Anxiety and depression.** Women with PCOS report a higher prevalence of depression, anxiety, and perceived stress than other women.[1]

Relationship between the microbiome and PCOS



Sex hormones appear to impact both the gut and vaginal microbiomes. For example, **a healthy vaginal microbiome is comprised of numerous species of *Lactobacilli***, which thrive when estrogen is prevalent. Women who have PCOS tend to have specific microbiome compositions. Their vaginal microbiomes tend to be characterized by a low number of *Lactobacillus* species and high amounts of pro-inflammatory microbiota, which increases the risk of infection and the odds of adverse reproductive issues, such as infertility and pregnancy loss. This microbial shift away from beneficial *Lactobacilli* is likely due, at least in part, to hormone imbalances of excess testosterone and other androgens in relation to estrogen.

The gut microbiome in women with PCOS is characterized by reduced species diversity and lower numbers of beneficial short-chain fatty acids (SCFAs). Abundant SCFAs are linked to improved gut health, a healthy immune system response, and reduced inflammation.

Thus, disordered vaginal and gut microbiomes can contribute to the overall inflammatory load prevalent in PCOS.

The inflammation connection

Although fat accumulation and weight issues can significantly affect the heart and blood vessels, fat cells increase systemic inflammation, which can have adverse metabolic effects throughout the body. Although short-term (acute) inflammation is a good thing – usually the result of your immune system mounting a reaction against an invading organism, irritant, or allergen, or an injury – long-term inflammation is at the center of many chronic conditions, including PCOS and associated conditions, such as heart disease. It's all a matter of balance. Click **here** for a short video on the connection between chronic inflammation and heart disease (a Thorne-Mayo Clinic collaboration).

Chronic low-level inflammation occurs first in the adipocytes, with an increase in TNF-α.[1] TNF-α stimulates a more general inflammatory state that can ultimately result in insulin resistance and other signs of metabolic dysfunction. In addition, a review that pooled the results of 63 clinical studies found that women who had PCOS, regardless of weight status, had higher levels of the inflammatory marker C-reactive protein than women without PCOS.[2]

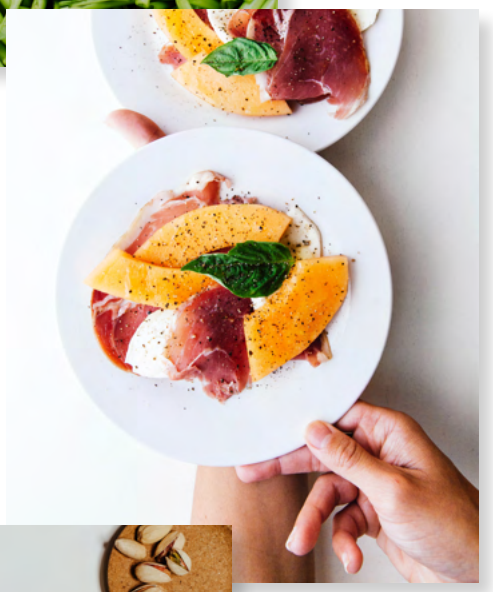
Therefore, diet, lifestyle, and nutritional supplementation approaches should focus on measures to decrease inflammatory load.

Why lifestyle approaches are so important

What does conventional medicine have to offer? There is no silver-bullet cure for PCOS. Conventional medicine focuses on medications or procedures that address specific aspects of PCOS – hormones, assisted reproductive techniques, ovulation-stimulating drugs, and medications, like metformin, that address metabolic issues. But none of these address the whole woman, which is why many women turn to diet, lifestyle, and nutritional supplement approaches.

Dietary advice

Numerous diets have been studied for supporting women with PCOS – including the Mediterranean and ketogenic diets. As little as 5-10 percent loss of body weight can make a big difference in reducing PCOS symptoms and restoring ovulation. So, in addition to other health benefits, it is important to find a diet that can help support your weight goals – whether the goal is to lose weight or maintain a healthy weight. Let's look at what several of the eating plans have to offer a woman who has PCOS.



Mediterranean diet

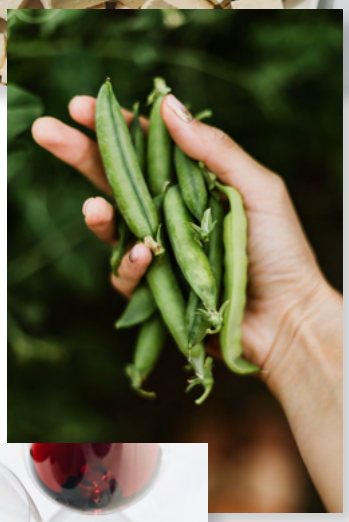
For the sixth year in a row, the Mediterranean diet is ranked best overall diet by *U.S. News & World Report*.[1]

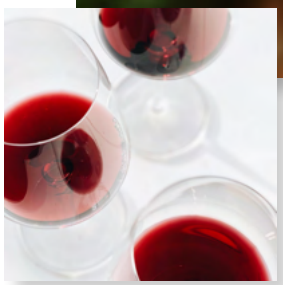
Benefits. The Mediterranean diet (MedDiet) has been the most extensively studied diet for benefitting various aspects of PCOS. Studies show adherence to the MedDiet:[2-4]

- Decreases the incidence or severity of PCOS
- Improves insulin sensitivity
- Decreases inflammation
- Decreases oxidative stress
- Improves body composition
- Supports weight loss
- Prevents metabolic syndrome
- Improves ovarian structure and function
- Decreases androgens
- Improves the composition of the gut microbiome, which decreases inflammation

Components. The Mediterranean diet consists of large amounts of vegetables and moderate amounts of fruit, in addition to whole grains, beans, nuts, and seeds. Fish, and to a lesser extent low-fat meat and poultry, are eaten in moderation. Fresh fruit is the typical daily dessert and olive oil is the primary source of fat. Red wine can be consumed in moderation. Simple carbs are kept to a minimum.

Dietary advice





Although the Mediterranean diet is essentially an anti-inflammatory diet, the **Thorne Modified Mediterranean Diet** goes a step further to ensure you are not including common allergens in your diet that can contribute to inflammation. The most common foods that cause food allergies or sensitivities are dairy, gluten (wheat, barley, rye), soy, eggs, fish, shellfish, peanuts, tree nuts, and sesame.

The health benefits of the MedDiet are attributable to the high level of plant polyphenols in vegetables, fruits, olive oil, and wine. Anti-inflammatory effects of the omega-3s in fish and nuts also contribute to the MedDiet's health benefits.

What about vegans? A vegan can still obtain the benefits of the MedDiet. It requires an emphasis on legumes – what has become popularized as the "pulse diet" – to include a variety of beans, lentils, and peas. Quinoa and soy products, such as tofu or tempeh, provide all essential amino acids, meaning they are complete proteins. If these are not included, then eating a wide variety of legumes, nuts, and seeds can fill this gap. Vegans might also need nutritional supplements, particularly vitamin B12, vitamin D, and omega-3 fatty acids – nutrients often lacking in a vegan diet.

Need to jumpstart weight loss? If a more restrictive diet is required – to get a jumpstart on weight loss – then check out the **Thorne Weight Management Program guide** that incorporates a lower-carb, lower-fat version of the MedDiet. The Guide provides specific diet guidelines and is designed to be used in 2-week increments.

Low glycemic index/load diet

Because PCOS is strongly associated with dysfunctional blood sugar metabolism – insulin resistance in particular – a focus on lower glycemic index (GI) foods is indicated. The MedDiet has the potential to also include higher GI foods. Thus, if the MedDiet is your diet of choice, then focus on foods with a low GI.

Benefits. Pooled data from analysis of eight studies comparing low- and high-glycemic index diets in women who had PCOS found a low-GI diet:[5]

- Decreased insulin resistance (measured by HOMA-IR)
- Decreased fasting insulin
- Decreased total cholesterol
- Decreased LDL cholesterol
- Decreased triglycerides
- Decreased waist circumference
- Decreased testosterone

Dietary advice

Components. What are low-glycemic index foods? A low-GI food is one that results in a gradual rise in blood sugar when eaten – rather than a spike. The glycemic index ranks carbohydrates on a scale of 0-100, based on the extent to which the carbohydrate in the food increases fasting blood sugar in healthy people. The lower the glycemic index number, the less the food's impact on blood sugar. The glycemic load is based on the glycemic index, but it also takes into account the amount of carbohydrate in a specific serving. The recommended value of a food's glycemic index is 55 or less and 10 or less for the glycemic load. **Glycemicindex.com** allows you to type in a food and receive its glycemic index and glycemic load. Use it as a general guide.

The glycemic index of some common foods

Low GI (54 or less)

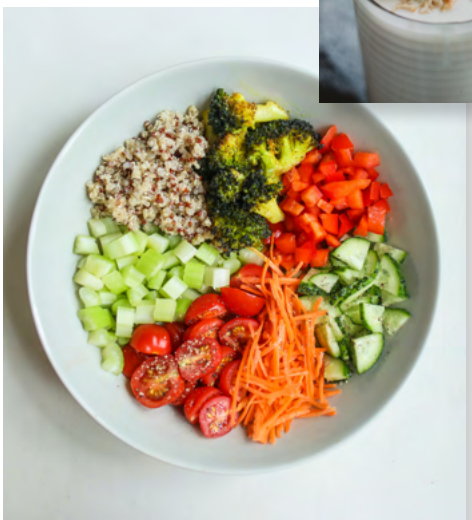
- Barley
- Sweet potatoes
- Most vegetables
- Yogurt

Medium GI (55-69)

- Rice
- Most fruits
- Pasta
- Oatmeal

High GI (70 or more)

- White bread
- Processed foods
- Soda
- Bagels



Ketogenic diet

Although not as extensively studied as the MedDiet, the ketogenic (keto) diet has been studied in women with PCOS. By its very nature, it is a low-glycemic index diet – so if it's keto, then it's low GI too.

Benefits. The keto diet can impact these aspects of PCOS:[2]

- Decreases insulin resistance
- Increases sex hormone-binding globulin (SHBG) – a protein that binds testosterone, thus decreasing free testosterone
- Reduces the ratio of luteinizing hormone (LH) to follicle-stimulating hormone (FSH) (which tends to be high in PCOS and inhibits ovulation)
- Supports weight loss

Components. The keto diet is heavily restrictive of carbohydrates, moderate in dietary protein amounts, and high in dietary fat. The concept is that this diet causes your body to switch from burning carbohydrates for fuel to almost exclusively burning fat instead, and, when this occurs, your body is in a state of nutritional ketosis.

Although the keto diet might have short-term benefits for PCOS, it might not be the best long-term maintenance diet because it can be deficient in fiber and some vitamins and minerals. In addition, most studies that analyzed metabolic benefits for blood sugar, insulin resistance, weight loss, cardiovascular health, and fatty liver looked at a very low-calorie keto diet, while a basic keto diet does not restrict calories.[6]

Other dietary considerations

In addition to all the good stuff to include in a PCOS diet, a discussion would not be complete without some mention of major food groups – the good and the bad.

Sugars

Sugar/High-fructose corn syrup. One of the biggest culprits is high-fructose corn syrup (HFCS) – which is used in soft drinks and in many processed foods. Its increased use over the past several decades mirrors the increase in obesity and associated metabolic derangements seen in the Unites States. Although sugar of any kind should be kept to a minimum, HFCS is implicated in PCOS-related health outcomes, including weight gain/obesity, insulin resistance, fatty liver, increased triglycerides, leptin resistance, increased protein glycosylation, and type 2 diabetes.[1]

Fats

Bad fats. Although fats are an essential component of a healthy diet, it is important to draw a distinction between "good fats" and "bad fats." Trans fats – artificially prepared fats, also referred to as hydrogenated fats (made by pumping hydrogen into the fat), found in margarine and other products (check labels!) – have been implicated in metabolic impairment. Trans fats were developed to convert liquid vegetable oils into solids, making them spreadable and increasing their shelf life. When trans fats were developed, butter was demonized as being artery clogging and bad for your heart. As it turns out, trans fats are far worse.

Vegetable oils like safflower or corn oil are high in polyunsaturated fatty acids (PUFAs) that can create inflammation by causing an imbalance between omega-6 and omega-3 fatty acids. Heating these polyunsaturated oils can also create cell-damaging free radicals.

Good fats. On the other hand, the omega-3 fatty acids EPA and DHA found in fatty cold-water fish are beneficial. The benefits of cold-water fish and their oils are due in part to their ability to help maintain a balanced inflammatory response throughout the body.

And there is a reason the MedDiet ranks so high as an overall healthy diet. As the primary oil in the MedDiet, olive oil is high in antioxidants and monounsaturated fatty acids (MUFAs), which means when it is lightly heated for cooking it does not produce free radicals like other vegetable oils that are mostly polyunsaturated do. Free radicals are molecules that disrupt cells and wreak havoc in the body. Organic, extra-virgin olive oil is recommended and can be used cold in salads and other dishes or in light sauteing. It is best not to cook with it on high heat because its essential health-providing nutrients can be destroyed.

Avocado oil has a similar fat profile to olive oil – high in MUFAs and antioxidants – and is a better choice than olive oil when high heat is needed for cooking because it has a higher smoking point. This means you can cook with avocado oil at a higher temperature before it starts tasting bad and being bad for you and your kitchen.

Other dietary considerations

Protein

A study analyzing a 3-day diet diary from 54 women with PCOS found that 36.7 percent of them had diets insufficient in protein.[2] The sources of protein in your diet will depend on whether you have chosen the keto diet or the MedDiet. Lean meat, fish, and poultry can be consumed with either diet, although the MedDiet focuses more heavily on fish and incorporates legumes, which are also good sources of fiber and have a beneficial effect on blood sugar – low glycemic index. Although the keto diet avoids most legumes, there are a few low-carb choices, including soybeans and lupini beans, which can be eaten in moderation. Lupini beans are also higher in protein than many legumes – 13 grams per half cup of cooked beans.

Fiber

The same 3-day study found the women's diets to be low in fiber, while higher than desirable in saturated fat, cholesterol, and sugar. In its analysis, 83.3 percent of the participants reported low fiber intake – defined as less than 25 grams of fiber daily. Eating a MedDiet is a good place to start in terms of increasing fiber intake.[2]

If you are looking to add extra fiber, then flaxseed is a particularly good choice. Flaxseed is known to lower testosterone levels because it binds to testosterone and removes it from the body. In a case study of a woman with a high testosterone level, 30 grams of flaxseed daily for four months significantly decreased her total and free testosterone levels.[3]

Spice it up

You need not look further than your kitchen cabinet to find herbs and spices that can help modulate some aspects of PCOS.

Spearmint tea was tested in 42 women with hirsutism, which is often associated with an elevated level of testosterone or DHEA. For 30 days, the women were randomized to drink either two cups of spearmint tea daily or a placebo tea. Women in the spearmint tea group had significant decreases in total and free testosterone levels compared to the women in the placebo tea group.[1]

Cinnamon. A significant body of information points to the benefit of cinnamon for supporting several cardiometabolic derangements associated with PCOS. In a study of 60 men and women with type 2 diabetes, one-half teaspoon of cinnamon daily for 40 days resulted in decreases in fasting blood sugar, triglycerides, LDL cholesterol, and total cholesterol.[2] Another large review study that analyzed the effects of 10 double-blind clinical studies found similar positive effects on cholesterol, triglycerides, and fasting blood sugar.[3] Cinnamon has also been shown to lower blood pressure.[4]

Turmeric. Turmeric has numerous antioxidant constituents that are not sensitive to destruction by cooking. Several studies have looked at the effect of turmeric on metabolic risk factors associated with PCOS. One study found 2.4 grams (approximately 1¼ teaspoons) of turmeric daily for four weeks resulted in reduced LDL cholesterol and C-reactive protein.[5]

Several other spices offer benefits for various aspect of PCOS.

Effect of spices on metabolic factors associated with PCOS

Spice	Health benefits	Therapeutic amount
Cayenne pepper	Decreases craving for junk food	⅛ teaspoon up to 1½ teaspoons
	Increases fat burning; decreases body fat	½ teaspoon
	Decreases LDL and increases HDL cholesterol	Frequent dietary consumption
Cinnamon	Decreases blood sugar, triglycerides, LDL and total cholesterol	½ teaspoon
Garlic	Lowers blood pressure	600-900 mg (¼ -½ teaspoon) garlic powder
	Lowers total and LDL cholesterol	2-4 cloves (20 grams)
Ginger	Lowers triglycerides and total cholesterol	Best results with less than 1 teaspoon daily
	Lowers fasting blood sugar and HbA1c	1 teaspoon (2 grams)
	Decreases inflammatory CRP	Various amounts
Turmeric	Decreases LDL cholesterol and CRP	1¼ teaspoons

Additional references available at the end of this blog at *Take 5 Daily:* 5 Spices for a Healthy Heart

Eat cleanly

PCOS is a condition associated with hormone imbalance. Therefore, meat and poultry, eaten in moderation, should be free of endocrine-disrupting hormones and organic when possible. Fish should be small, non-accumulating, low-mercury fish. Some of the fish lowest in contaminants, including PCBs and mercury, include trout, shrimp, halibut, flounder, tilapia, cod, and haddock.

In addition, some studies have found increased levels of pesticides in women who have PCOS.[1] Therefore, produce should be organic when possible – particularly the fruits and vegetables on the list of produce that typically contain the highest amount of pesticide residues (referred to the Dirty Dozen). The Environmental Working Group (EWG) tests produce each year, and while the lists remain roughly the same from year to year, there can be minor changes (the 2023 Dirty Dozen list is identical to the 2021 list).[2] On the bright side, this EWG also comes up with a list of fruits and vegetables least likely to contain pesticide residues – dubbed the Clean Fifteen. If your favorite fruits and vegetables are not on either list, then it's likely they fall somewhere in between the cleanest 15 and the dirtiest 12; for example, broccoli is #22. You can view the entire list of 46 tested fruits and vegetables, going from dirtiest to cleanest, here: **Environmental Working Group's 2023 Shopper's Guide to Pesticides in Produce**.

As noted above, exposure to BPA increases the risk for PCOS. BPA can leach into food from polycarbonate tableware, food storage containers, the inner lining of canned foods (although many tin can manufacturers are now using alternatives), and plastic water bottles.

2023 Dirty Dozen

- Strawberries
- Spinach
- Kale; collard and mustard greens
- Peaches
- Pears
- Nectarines
- Apples
- Grapes
- Bell and hot peppers
- Cherries
- Blueberries
- Green Beans

2023 Clean Fifteen

- Avocados
- Sweet corn
- Pineapple
- Onions
- Papaya
- Sweet peas (frozen)
- Asparagus
- Honeydew melon
- Kiwi
- Cabbage
- Mushrooms
- Mangoes
- Sweet potatoes
- Watermelon
- Carrots

Specific nutrients for support of women with PCOS

In addition to macro-nutrient imbalances, the diets of women with PCOS might be deficient in several specific vitamins and minerals. A study that analyzed the diet diaries of women with PCOS found 70 percent had a low intake of folate, 36.7 percent had a low intake of vitamin C, and 26.7 percent had a low intake of vitamin B12. Intakes of calcium, potassium, and magnesium were also below recommended daily amounts.[1] In addition to a healthy diet, women who have PCOS should be advised to incorporate a multi-vitamin/mineral supplement into their daily regimen.

Vitamin D

Women with PCOS, particularly if they contend with a weight issue, tend to have a low vitamin D level. In a study that analyzed the diets of women with PCOS, the average daily consumption of vitamin D was only 136 IU (Note: The Recommended Daily Allowance for vitamin D is 600 IU, which is not enough to maintain a sufficient level in many individuals).[1]

In one study, a low vitamin D level was associated with insulin resistance in women with PCOS but not in a healthy control group.[2] Evidence suggests that maintaining a sufficient level of vitamin D supports a healthy balance of testosterone and SHBG (the protein that binds to free testosterone), benefits menstrual regularity, and decreases hirsutism.*

There are food sources of vitamin D, either naturally occurring or in foods that have been fortified with it (see table). By far the food with the highest amount of vitamin D3 is wild-caught salmon, which can have almost 1,000 IU in 3.5 ounces (100 grams). But because there are not many foods that naturally contain vitamin D, it can be difficult to acquire the daily vitamin D you require from diet alone, so a vitamin D supplement might be needed to maintain an adequate level.

Foods naturally high in vitamin D3:

- Fatty fish, including salmon, tuna, mackerel, sardines, herring, halibut, trout
- Beef liver
- Eggs
- Cod liver oil
- Mushrooms (vitamin D2)
- Cheese

Food often fortified with vitamin D (but read the label):

- Milk
- Soy milk
- Orange juice
- Cereals

*These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.

Specific nutrients for support of women with PCOS

Omega-3 fatty acids

Besides being a good source of vitamin D, fish are high in omega-3 fatty acids. These important fatty acids offer nutritional support to women with PCOS by supporting a normal inflammatory balance, a healthy testosterone level, menstrual regularity, and a positive mood.*[3,4]

Fish that are high in omega-3s include salmon, mackerel, herring, sardines, anchovies, lake trout, and albacore tuna (some of the same fish that provide good dietary sources of vitamin D3). Addition of a nutritional supplement that contains both EPA and DHA (which are tested for the presence of heavy metals and PCBs) would assure regular daily intake of these important essential fatty acids without concern for contamination.

Inositol

Inositol is a naturally occurring substance in the body – found in high concentrations in a number of tissues, including the brain. Inositol is important for facilitating signals between cells in response to hormones, neurotransmitters, and other important molecules. The combination of myo-inositol and D-chiro-inositol provides nutritional support for women who have PCOS by supporting insulin sensitivity.* This in turn supports ovulation, menstrual regularity, healthy blood sugar maintenance, androgen hormone balance, weight management, normal hair growth (decreased hirsutism), and clear, non-oily skin.*[5]

Folate

As noted above, according to one study, 70 percent of women with PCOS have insufficient dietary intake of folate, found in especially high amounts in green leafy vegetables (folate got its name from the Latin word folium – from which foliage was derived). Folate is essential when a woman is trying to conceive. It is particularly important to have a sufficient folate level prior to conception. Not only does folate help prevent neural tube birth defects during the first trimester of fetal development, evidence also suggests a higher folate level improves the likelihood of becoming pregnant.*

In one study, the women with the highest levels of folate had more than a one-and-a-half times greater likelihood of becoming pregnant compared to women with the lowest folate levels.*[6] Another study found women who reported taking folic acid alone or in a multivitamin supplement had higher rates of pregnancy than women who did not take folic acid.* Supplementation increased pregnancy rates by 10 percent in women with a regular menstrual cycle and by 36 percent in women with an irregular cycle.*[7]

Two other studies found that adding folate to myo-inositol might provide even more benefit for supporting healthy oocytes (eggs), ovulation, hormone balance, and pregnancy rate.*[8,9]

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Botanicals that can benefit PCOS

Although there is a laundry list of botanicals that can provide benefit for PCOS, here are a few standouts on the list (see also kitchen cabinet spices in Spice It Up).

Curcumin

Curcumin is the primary curcuminoid found in the spice turmeric (Latin name *Curcuma longa*). Although turmeric has long been used as a spice in Indian cooking and is what gives curry its golden color, both turmeric and curcumin isolated from turmeric also have a long history of medicinal use.

An analysis of 12 studies found extracts of curcumin support healthy body composition, including BMI, waist circumference, and body weight.*[1]

Like many flavonoids, curcumin is not well absorbed, but its absorption can be improved when the botanical extract is bound to phospholipids to form a phytosome. Curcumin phytosome has been studied for several metabolic issues related to PCOS. It has been shown to support insulin sensitivity, as well as maintenance of normal blood sugar, cholesterol, and triglyceride levels.*[2,3] Curcumin has also been shown to support fat metabolism in the liver.*[4]

Bergamot

The yellow-green bergamot fruit, the size of a small orange, is a hybrid of bitter orange and lemon. You might be most familiar with bergamot as an ingredient in Earl Grey tea. The essential oil from the inner peel is mixed with tea leaves, providing Earl Grey tea's unique floral, citrus aroma and flavor. Both the essential oils in the peel, as well as the polyphenols in the juice, are used therapeutically, with the polyphenol fractions sparking the most interest for metabolic health.

Two recent studies found bergamot polyphenols are superior to placebo for their effects on fat metabolism, which in turn supports healthy cholesterol and triglyceride levels.*[5,6] Additional studies show similar results in maintaining healthy lipid and blood sugar levels.*[7-9]

In addition to supporting healthy cholesterol and blood sugar levels, bergamot can benefit individuals working on weight management.* Extracts have been shown to support a decrease in visceral fat (the kind of fat stored around organs) by supporting efficient fat metabolism.*[5] Bergamot has also been shown in clinical trials to promote healthy liver function, clearance of fat from the liver, and a normal balance of liver enzymes.*[9]

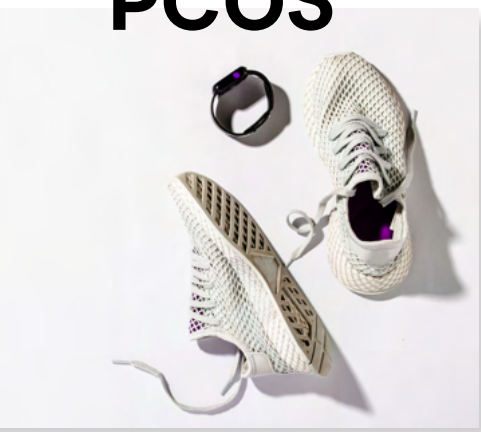
Berberine

Berberine is a constituent of many plants, including Indian barberry, Oregon grape, goldthread (Coptis), and goldenseal. Although berberine has many potential therapeutic benefits, some of the best-researched ones involve support for metabolic aspects of PCOS. In one study of women with PCOS, berberine HCl (500 mg twice daily) significantly improved BMI, waist circumference, and waist-to-hip ratio.* It also significantly benefited glucose and lipid metabolism and supported balanced testosterone and SHBG.*[10]

Other studies in women with PCOS found berberine promotes balanced androgen levels, normal inflammatory responses, and insulin sensitivity.*[11,12]

*These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.

Exercise for PCOS



Research on PCOS and exercise points to the most significant benefits coming from vigorous exercise, either alone or in combination with resistance training. An analysis of 19 separate studies that included 777 women with PCOS found that vigorous exercise was more important than the length of time exercised in improving aspects of PCOS – specifically BMI, waist circumference, insulin resistance, and cardiorespiratory fitness (VO_2peak). Taken together, the meta-analysis points to the most benefit coming from exercising at least 120 minutes weekly for at least 10-12 weeks.[1]

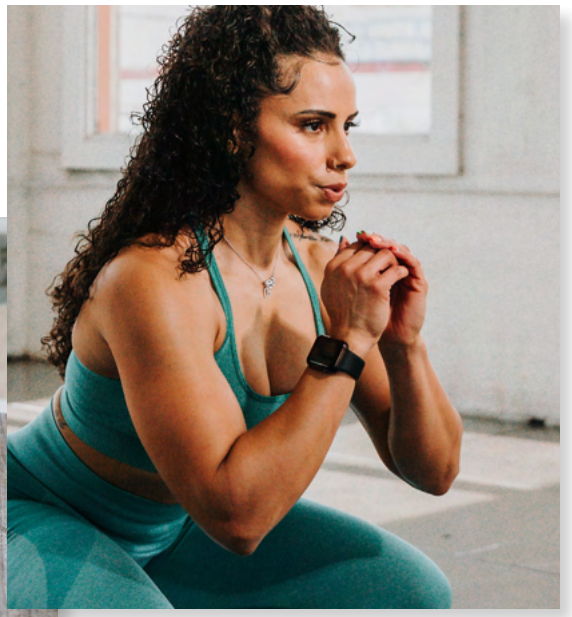
Another systematic review found that vigorous aerobic exercise (at least 30 minutes three times weekly) was associated with improved insulin resistance, while resistance/strength training was associated with improved androgen levels.[2]

A third comprehensive review looked at high-intensity interval training (HIIT) for impacting metabolic markers in women with PCOS. Seven trials including 423 women found that HIIT three times weekly for 10 weeks resulted in decreased BMI and HOMA-IR in PCOS.[3]

Summary of exercise recommendations:

- Vigorous HIIT three times a week, for a total of 90-120 minutes weekly
- Re-evaluate after a minimum of 10 weeks
- Include resistance training twice weekly

According to this blog at *Take 5 Daily* in collaboration with Mayo Clinic, HIIT might also slow the aging process. **This specific form of exercise may slow aging**.



Stress reduction

In addition to exercise, other stress-reducing techniques offer benefit to women with PCOS.

Mindfulness combined with yoga

Both mindfulness techniques and yoga might provide benefit. In one study, 31 women with PCOS were randomly assigned to a mindfulness yoga group, while the other half had no intervention. Mindfulness training prior to group mindfulness yoga sessions consisted of a three-hour tutorial on breathing techniques, tapping, guided imagery, and positive self-talk. Yoga sessions were one hour, three times weekly, for three months. In addition to improvement in anxiety and depression, free testosterone was significantly lower in the women who engaged in the yoga intervention, with DHEA levels trending lower. Improvements in androgen levels were seen for as long as three months after the intervention ended.[1]

Mindfulness meditation

In another study, 38 women with PCOS were randomly assigned to mindfulness meditation or no intervention. Quality of life, anxiety, and depression were assessed via questionnaires, and salivary cortisol was measured at three time points during the day prior to the beginning of the study and after eight weeks. The intervention group had a 30-minute mindfulness tutorial and then practiced what they learned via a CD for 30 minutes daily – the recommendation was to do it at bedtime. The women in the mindfulness group, but not in the control group, experienced decreased anxiety, depression, and cortisol levels, as well as improved quality of life.[2]

Sleep

As with so many other chronic health conditions, poor sleep is also associated with PCOS. High levels of anxiety and depression in women with PCOS are often seen in conjunction with sleep disorders. Poor sleep is also associated with the metabolic disorders seen in PCOS, including insulin resistance, overweight, activation of inflammatory pathways, and type 2 diabetes. Although melatonin is thought of as a sleep hormone secreted by the pineal gland in the brain, it is also found in many other tissues in the body, including ovarian follicular fluid, where it provides protective antioxidant effects. Melatonin levels have been noted to decrease in follicular fluid of women with PCOS.[1]

What can you do? In addition to exercising and other stress reduction techniques discussed here, avoid exposure to blue light at night. An increasing amount of research is revealing that exposure to blue light – the kind that comes from your cell phone, computer, tablet, or TV – can wreak havoc with your sleep, particularly in the evening. So begin winding down your exposure to blue-light emitting electronics a couple of hours before going to bed. Studies show that for every hour you are exposed to blue light, melatonin production is suppressed for half an hour. If you need to use a blue-light emitting device before bed, then there are apps to reduce blue light from screens or blue-light blocking glasses.

It is important to expose yourself to light – but in the morning, not in the evening. If you can, sunlight is best. Weather and latitude permitting, try getting 20-30 minutes of sunlight exposure in the morning. If your schedule is tight, then combine it with exercise or meditation.

Create a bedtime ritual

- Develop a bedtime ritual that works for you
  - Take a warm (but not too hot) bath (add Epsom salts or lavender oil)
  - Have a relaxing cup of herbal tea, such as chamomile or spearmint (see Spice it up section for added benefit of spearmint tea)
- Keep on a schedule of going to bed and getting up the same time every day – even on weekends.
- Create a cool, dark, quiet sleeping environment
- Noise should be limited to something soothing, like pink noise. There is emerging evidence that listening to certain sound frequencies – known as pink noise – can enhance the deep phases of sleep. Pink noise is often found in nature, such as a steady rainfall. You can find recordings of **pink noise online here**, for example. Look for a site that provides just the sound with a black screen.

Additional supportive resources at *Take 5 Daily*

Lifestyle Tips for Managing PCOS

The Most Frequent Cause of Female Infertility? PCOS

A Balancing Act: The Microbiome and Polycystic Ovary Syndrome

For additional help with fertility, see the **Thorne Fertility Guide**.

Recommendations for you

(This page is for your health-care professional to make recommendations.)

Dietary recommendations

- ☐ Follow the Mediterranean diet
- ☐ Follow the Mediterranean diet with low glycemic index
- ☐ Follow the Thorne modified Mediterranean diet that eliminates foods you are sensitive or allergic to
- ☐ Follow the ketogenic diet
- ☐ Jumpstart with a low-fat, low-carb weight management diet for _____ weeks. (See **Thorne Weight Management Program guide**, which is set up in 2-week increments).

Other dietary recommendations

Supplement recommendations

Check the box(s) for the supplement recommendations.

- ☐ Ovarian Care: _____ scoop(s), _____ per day
- ☐ Metabolic Health: _____ capsule(s), _____ per day
- ☐ Berberine: _____ capsule(s), _____ per day
- ☐ Women's Daily Probiotic: _____ capsule(s), _____ per day
- ☐ Vitamin D-5,000: _____ capsule(s), _____ per day
- ☐ Super EPA: _____ softgel(s), _____ per day
- ☐ 5-MTHF 5 mg: _____ capsule(s), _____ per day
- ☐ Basic Prenatal: _____ capsule(s), _____ per day
- ☐ Prenatal DHA: _____ softgel(s), _____ per day

Recommendations for you

(This page is for your health-care professional to make recommendations.)

Additional supplement recommendations

Exercise, stress, and sleep support recommendations

Recipes

Mediterranean diet/low glycemic index recipes

Here are several recipes that are representative of the diet of populations living in the countries that surround the Mediterranean Sea – including two vegan options – plus, they're gluten free. These three recipes are also suitable for a low-glycemic index diet. They are selected from the book, *Nourishing Meals: Healthy, Gluten-free Recipes for the Whole Family*, by Alissa Sergersten and Tom Malterre, MSN, CN.

Italian white bean soup

Serves: 12

Ingredients

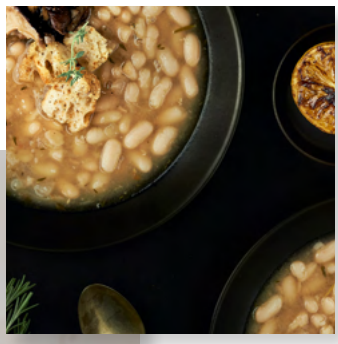
2-3 tbsp	Extra virgin olive oil	**1 tsp**	Ground black pepper
12 cups	Chicken stock	**2-3 cups**	Thinly sliced kale
1 large	Onion, chopped	**2 tbsp**	Italian seasoning
4 cups	Diced tomatoes	**½-1 cup**	Chopped parsley
3-4 cloves	Garlic, crushed	**4-5**	Carrots, diced
3-4 tbsp	Tomato paste	**3 tsp**	Herbamare or sea salt
1 tsp	Paprika	**3-4 stalks**	Celery, chopped
6 cups	Cooked navy beans	**½ lb**	Green beans, cut into 2-inch pieces

Directions

Heat an 8-quart pot over medium heat and add olive oil, then add onion; **sauté** for 8-10 minutes or until soft and beginning to change color.

Add garlic, spices, and herbs; sauté one minute more. Then add carrots, celery, and green beans; sauté for 2 minutes. Then add stock, tomatoes, and tomato paste, and **cover and simmer** for 20-25 minutes or until the vegetables are tender.

Stir in cooked beans, kale, and parsley; simmer 5 minutes more. Add salt; taste and adjust salt and seasonings if necessary. Store leftovers in the refrigerator for up to a week.



Recipes

Slow cooker chicken stew

Serves: 4-6

Serve this stew over cooked long-grain brown rice with a salad on the side. Using a slow cooker the flavors come together beautifully and the chicken is very tender.

Ingredients

1 cup	Diced shallots
3 stalks	Celery, diced
4	Carrots, peeled and diced
1.5 lbs	Boneless chicken breast, cut into chunks
14 oz	Canned crushed fire-roasted tomatoes
1 cup	Water
⅓ cup	Dry white wine
¼ cup	Extra virgin olive oil
1 tbsp	Italian seasoning
1-2 tsp	Herbamare or sea salt
Etc	Ground black pepper

Directions

Add all ingredients to a slow cooker and cook on high for 4-5 hours or on low for 6-8 hours.

Oven Variation: Place all ingredients in a covered casserole dish and bake for 2.5 hours at 300°F.

Recipes

Chipotle black bean & yam stew

Serves: 6-8

When using canned black beans it will take about four cans. Be sure to save the bean cooking liquid from the cans. Bean cooking liquid rather than water works better in this recipe to create a thicker stew. You can also substitute the yams in this recipe with a small butternut squash that has been peeled and diced.

Ingredients

2 tbsp	Extra virgin olive oil	**½ tsp**	Dried oregano
6 cups	Cooked black beans	**1**	Lime, juiced (2-3 tbsp)
1 medium	Yellow onion, chopped	**½-1 tsp**	Chipotle chili powder
4 cups	Bean cooking liquid or water	**4**	Cloves garlic, crushed
2 tsp	Ground cumin	**2-3 tsp**	Herbamare® or sea salt
1 medium	Red bell pepper, diced	**2 medium**	Yams, peeled & diced (~4 cups)

Directions

Heat a 6- or 8-quart pot over **medium heat**. Add the oil, then add onions; **sauté** for 5-7 minutes. Then add the spices, Herbamare, yams, and garlic, and sauté a few minutes more.

Add the black beans and bean cooking liquid; simmer uncovered for 10-15 minutes or until yams are **barely tender** but not yet cooked (timing will depend on the size of the diced yams). **Add** diced peppers and simmer for 10 minutes more.

Taste and adjust salt and spices if necessary. Remove from heat and **stir in** lime juice.

Nutrition Tip: More and more research points to the importance of consuming foods that make your intestinal microbiome happy. Researchers in Mexico have found that black beans do a great job at this. Black beans contain a higher quantity of fiber that is not digestible by our enzymes, but are digested by organisms in our intestines. These undigested black bean portions feed certain beneficial bacteria and allow them to produce a substance called butyric acid, which is one of the preferred sources of energy for the cells lining the colon, allowing them to function properly and remain healthy.

This blog on thorne.com – *Take 5 Daily* – includes nine additional Mediterranean diet recipes.

9 must-try breakfast, lunch, and dinner recipes for a Mediterranean diet.

And check out our Metabolic Syndrome Guide for additional recipes and daily meal plans. You'll even find some dessert recipes.

Keto diet recipes

If you decide the ketogenic diet is the best option for you, then we have you covered there, too. This first recipe might surprise you because it includes fruit, which is usually not acceptable in a keto diet. Although most fruits are too high in carbs, berries are an exception – particularly raspberries, strawberries, and blackberries. They are lower in carbs and higher in fiber than other fruits.

Berry blast yogurt parfait

Ingredients

Yogurt Base

½ cup	Unsweetened coconut yogurt *(for example, So Delicious brand = 5 grams of carbs)*
To taste	Drops of liquid vanilla stevia *(if this is your first time utilizing a sweetener like stevia, then be mindful because stevia is very sweet; so, start low and work your up until you find your desired sweetness level.)*

Fruit Addition and Nut addition

¼ cup	Mixed berries, such as raspberries, strawberries, and/or blackberries
¼ cup	Spiced Low-Carb Pecans (see recipe below), chopped

Directions

Mix ingredients for the yogurt base. Start light on the liquid sweetener because you can always add more, but hard to fix if it's too sweet.

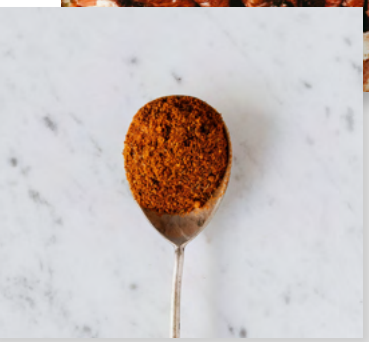
Fold the fruit addition into the yogurt base.

Sprinkle the chopped pecans over the fruit/yogurt mixture.

Enjoy!

Variation: Sprinkle powdered cinnamon or grate some lemon zest and add it to the top of the mixture to bring about some different flavors.

Keto diet recipes



Spiced low-carb pecans

Ingredients

1 cup	Raw pecan halves
⅛ cup	Butter, or vegan butter
1 tbsp	Monk fruit in the raw
¼ tsp	Pumpkin pie spice
¼ tsp	Vanilla powder
¼ tsp	Salt

Directions

Preheat oven to bake at 325°F.

While the oven heats, **melt** the butter gently on the stovetop or in the microwave.

Add the dry ingredients to the melted butter and **mix** thoroughly with a fork to break up clumps.

Place the pecans onto a small baking sheet and cover them with the mixture. **Roll** the pecans in the mixture to ensure even coating.

Bake the pecans for 10-12 minutes. **Place** the mixture on a piece of parchment to cool.

Variation: Want some heat? Sprinkle a pinch of cayenne on the pecans as they cool to create some heat!

Keto stuffed peppers

from thebigmansworld.com

Serves 4

Ingredients

4 large	Bell peppers
1 tbsp	Olive oil
1 small	Onion finely chopped
1 pound	Lean ground beef (use ground turkey or chicken if you prefer
2 tbsp	Keto taco seasoning (see recipe below)
1 15 oz	Can of diced tomatoes in their juice
1 cup	Cauliflower rice steamed
2 cups	Shredded cheese divided

Directions

Preheat the oven to 375°F. Lightly **grease** a large baking dish.

Slice off the tops of the bell peppers and remove seeds and excess membranes. **Slice** each bell pepper in half and **place** them in the lined dish.

In a large non-stick pan, **heat** the olive oil on medium. When hot, **add** the onions and sauté for one minute.

Add the ground meat and cook until no longer pink. **Add** the taco seasoning, then pour in the diced tomatoes along with the juice. Let **simmer** for one minute.

Remove the pan from the heat. **Stir** in the steamed cauliflower rice and one cup of shredded cheese.

Evenly **distribute** the filling amongst the bell pepper halves and **top** with remaining cheese.

Bake the stuffed peppers for 20-25 minutes, until the cheese is melted and the bell peppers are tender.

Remove the stuffed peppers from the oven and **serve** immediately.

Note: If you prefer, then these can be cooked in an air fryer at 400°F for 10 minutes (turn after 5 minutes)

Keto diet recipes

Keto taco seasoning

from gimmedelicious.com

Ingredients

2 tbsp	Chili powder	**1 tsp**	Garlic powder
1 tbsp	Cumin	**1 tsp**	Onion powder
2 tsp	Paprika	**1 tsp**	Black pepper
2 tsp	Salt	**1 tsp**	Oregano

Directions

Add all spices to a mason jar, close tightly, and **shake** until mixed thoroughly

Check out more keto-friendly recipes at *Take 5 Daily:*

8 Easy Keto-Friendly Recipes for Everyday Meals

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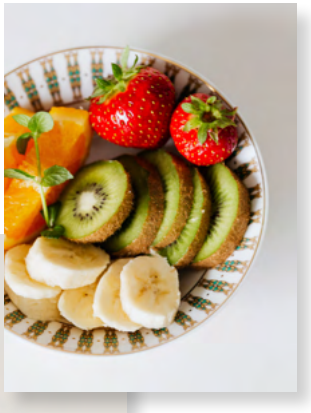

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