

## Polycystic Ovary Syndrome (PCOS): Condition Information

PCOS is a set of symptoms that result from a hormonal imbalance affecting women and girls of childbearing age. Women with PCOS usually have at least two of the following three conditions:<sup>1</sup>

- Absence of ovulation, leading to irregular menstrual periods or no periods at all
- High levels of androgens (a type of hormone) or signs of high androgens, such as having excess body or facial hair
- Cysts (fluid-filled sacs) on one or both ovaries—"polycystic" literally means "having many cysts"

Some women diagnosed with PCOS have the first two conditions listed above as well as other symptoms of PCOS but do not have cysts on their ovaries.

PCOS is the most common cause of anovulatory (pronounced *an-OV-yuh-luh-tawr-ee*) infertility, meaning that the infertility results from the absence of ovulation, the process that releases a mature egg from the ovary every month. Many women don't find out that they have PCOS until they have trouble getting pregnant.

PCOS can cause other problems as well, such as unwanted hair growth, dark patches of skin, acne, weight gain, and irregular bleeding.

Women with PCOS are also at higher risk for:<sup>2</sup>

- Obstructive sleep apnea, a disorder that causes pauses in breathing during sleep
- Insulin resistance
- Metabolic syndrome, a group of risk factors for heart disease and type 2 diabetes
- Type 2 diabetes
- Obesity
- Heart disease and high blood pressure (cardiovascular disease)
- Mood disorders
- Endometrial hyperplasia and endometrial cancer

## What are the symptoms of PCOS?

In addition to the three features used to diagnose PCOS (absence of ovulation, high levels of androgens, and ovarian cysts), PCOS has many signs and symptoms, some of which may not seem to be related:<sup>1,4</sup>

- Menstrual irregularities:
  - No menstrual periods—called amenorrhea (pronounced *ey-men-uh-REE-uh*)
  - Frequently missed periods—called oligomenorrhea (pronounced *ol-i-goh-men-uh-REE-uh*)
  - Very heavy periods
  - Bleeding but no ovulation—called anovulatory periods
- Infertility
- Excess hair growth on the face, chest, belly, or upper thighs—a condition called hirsutism (pronounced *HUR-soo-tiz-uhm*)
- Severe, late-onset, or persistent acne that does not respond well to usual treatments
- Obesity, weight gain, or trouble losing weight, especially around the waist
- Pelvic pain
- Oily skin
- Patches of thickened, dark, velvety skin—a condition called acanthosis nigricans (pronounced *ay-kan-THOE-sis NY-grih-kanz*)

Because many women don't consider problems such as oily skin, extra hair growth, or acne to be symptoms of a serious health condition, they may not mention these things to their health care providers. As a result, many women aren't diagnosed with PCOS until they have trouble getting pregnant or if they have abnormal periods or missed periods.

Although PCOS is a leading cause of infertility, many women with PCOS can and do get pregnant. Pregnant women who have PCOS, however, are at higher risk for certain problems, such as miscarriage

## How many people are affected or at risk for PCOS?

How many people are affected by PCOS?

PCOS affects between 5% and 10% of women ages 18 to 44.<sup>1,2</sup> Because the criteria used to define PCOS are still changing, the exact number of women affected is unknown, but is estimated to be about one in every 10 to 15 women. Most women are diagnosed during their twenties or thirties, but PCOS may affect girls as young as 11 who haven't even had their first period.<sup>3</sup>

## Who is at risk for PCOS?

Women are at higher risk for PCOS if they:

- Have a mother or sister with PCOS
- Are obese

## What causes PCOS?

Researchers and health care providers know that genetic and environmental factors contribute to the development of PCOS, but do not know exactly what causes PCOS.

Because the symptoms of PCOS tend to run in families, the syndrome is probably caused, at least in part, by a change, or mutation, in one or more genes. Recent research conducted in animal models suggests that in some cases PCOS may be caused by genetic or chemical changes that occur in the womb.<sup>1</sup>

PCOS likely results from a combination of causes, including genes and environmental factors.

## What causes the symptoms of PCOS?

Most of the symptoms of PCOS are caused by higher-than-normal levels of certain hormones, called androgens.

The ovaries produce hormones, which are chemicals that control functions in the body. One of the hormones that the ovaries make is estrogen—sometimes called the "female hormone" because women's bodies make more of it than men's bodies do. The ovaries also make androgens—sometimes called "male hormones" because men's bodies make more of them than women's bodies do. Men and women need certain levels of both hormones for normal health.

In women with PCOS, the hormones are out of balance: these women have higher-than-normal levels of androgens and may have lower-than-normal levels of estrogen. High levels of androgens can:

- Interfere with signals from the brain that normally result in ovulation, so that ovulation does not occur regularly
- Cause the follicles—small, fluid-filled cysts within the ovaries in which eggs grow and mature—to enlarge, forming cysts<sup>4</sup>
- Produce other symptoms of PCOS, including excess hair growth and acne<sup>3,4</sup>

Other symptoms of PCOS result from problems with insulin, another of the body's hormones. Insulin helps move sugar (also called glucose) from the bloodstream into cells to use as energy. When cells don't respond normally to insulin, the level of sugar in the blood rises. In addition, the level of insulin goes up as the body produces more and more of it to try to get glucose into the cells. Too much insulin increases the production of androgens,<sup>5</sup> which then cause symptoms of PCOS. High levels of insulin can also increase appetite and lead to weight gain.<sup>3</sup> High insulin levels are also linked to acanthosis nigricans.<sup>3</sup>

## How do health care providers diagnose PCOS?

Your health care provider may suspect PCOS if you have eight or fewer periods per year, excess body hair or acne, or irregular periods. After obtaining a clinical history suggestive of PCOS, your health care provider will rule out other conditions that may cause similar symptoms. Some of these conditions include:

- Excess hormone production by the adrenal glands, called adrenal hyperplasia (pronounced *uh-DREEN-I hay-per-PLYE-zuh*)
- Problems with the function of the thyroid gland
- Excess production of the hormone prolactin by the pituitary gland, called hyperprolactinemia (pronounced *hi-per-pro-lak-tuh-NEE-mee-uh*).

After ruling out other conditions and before making a diagnosis of PCOS, your health care provider will do the following:<sup>1,2</sup>

- **Take a full family history.** Your health care provider will ask you about your menstrual cycle and any history of infertility. He or she also will ask you whether you have a mother or sister with PCOS or with symptoms like yours, as PCOS tends to run in families.
- **Conduct a complete physical exam.** Your health care provider will do a physical exam and look for extra hair growth, acne, and other signs of high levels of the hormone androgen. He or she also will take your blood pressure, measure your waist, and calculate your body mass index, a measure of your body fat based on your height and weight.

- **Take blood samples.** Your health care provider will check the levels of androgens, cholesterol, and sugar in your blood.
- **Do a pelvic exam or ultrasound to check your ovaries.** During the pelvic exam, your health care provider will insert two fingers into your vagina and press on your belly to feel for cysts on your ovaries. To help see cysts in your ovaries, he or she might recommend an ultrasound, a test that uses sound waves to take a picture of your pelvic area. Your health care provider also will check how thick the lining of your uterus is; if your periods are irregular, the lining of your uterus could be thicker than normal.

A woman who has at least two of the following three conditions may be diagnosed with PCOS:

- Long-term absence of ovulation (the process that releases a mature egg from the ovary) that leads to menstrual irregularities
- High levels of androgens that do not result from other causes or conditions or signs of high androgens, such as excess body or facial hair
- More than 12 cysts of a specific size on one or both of the ovaries (as detected by ultrasound)

Some women diagnosed with PCOS have the first two symptoms but no cysts on their ovaries.

## Is there a cure for PCOS?

There is currently no cure for PCOS, and it does not go away on its own. Even after menopause, women with PCOS often continue to have high levels of androgens as well as insulin resistance. This means that the health risks associated with PCOS are lifelong.<sup>1</sup>

## What are the treatments for PCOS?

Because PCOS has a broad range of symptoms, health care providers may use a variety of treatments for this condition and its symptoms.<sup>1</sup>

The treatment(s) your health care provider suggests will depend on:

- Your symptoms
- Your other health problems
- Whether you want to get pregnant

Because some of the common treatments for PCOS symptoms can prevent pregnancy or may harm the fetus during pregnancy, it's important to discuss your fertility goals with your health care provider while discussing treatment options. Be sure you fully understand your treatment options and their effects on pregnancy before deciding on a course of treatment.

You should also discuss the risks of treatments with your health care provider. All treatments have risks, and some of them can be serious. Also, some unhealthy lifestyle factors such as smoking can increase these risks, and thus you should discuss with your health care provider the best way to eliminate these practices.

## Treatments to Relieve Symptoms of PCOS

- [Lifestyle changes](#)
- [Oral contraceptives](#)
- [Insulin-sensitizing agents](#)
- [Anti-androgens](#)
- [Removing or hiding unwanted hair](#)
- [Acne treatment](#)

### Lifestyle Changes

In many cases, the first action that health care providers recommend for women with PCOS is that they make specific lifestyle changes, such as following a lower-calorie diet, losing weight, and getting more physical activity.<sup>1,4</sup>

Losing weight and being more physically active can minimize many PCOS symptoms and related conditions. Even a 5% weight loss can improve many symptoms of PCOS.<sup>3</sup>

- Weight loss can restore ovulation and make your menstrual cycles more normal, which can improve your chances of pregnancy.<sup>1,4</sup>
- Losing weight reduces the risk of diabetes and lowers cholesterol levels.<sup>1,5</sup>

- For many women, weight loss reduces such symptoms as excessive hair growth and acne.<sup>1,6</sup>
- Physical activity can reduce depression associated with PCOS.<sup>7</sup>

No single diet or activity plan is known to work better than another in helping women with PCOS. Talk to your health care provider about designing a plan that's best for you.

## Oral Contraceptives

Also called birth control pills or "the Pill," hormonal contraceptives can be used for the long-term treatment of women with PCOS who do not wish to become pregnant,<sup>1</sup> and in fact they are the primary treatment for these women. Oral contraceptive pills contain a combination of the hormones estrogen and progestin. In women with PCOS, these hormones:<sup>1</sup>

- Make menstrual periods more regular
- Reduce the level of androgens produced by the ovaries, leading to reduction in androgen activity
- Help clear acne and reduce excess hair growth

Oral contraceptives also can help lower the risk of certain types of cancers.<sup>8</sup> There is no one oral contraceptive that works best for women with PCOS, but those that are less androgenic are more effective at treating the symptoms of PCOS.<sup>9</sup> Please note that oral contraceptives, like all medications, are associated with some level of risk for side effects, some of them serious. Discuss all possible side effects with your health care provider before making a final decision on a treatment.

## Insulin-sensitizing Agents

These types of medications make the body more responsive to insulin and keep glucose levels more stable.<sup>1,10</sup> In women with PCOS, these medications can help:

- Clear acne and reduce hair growth
- Improve weight loss
- Lower cholesterol levels
- Make periods more regular
- Slightly reduce infertility associated with PCOS<sup>11</sup>

After four to six months of using these medications, women with PCOS may start ovulating naturally.<sup>12</sup>

The U.S. Food and Drug Administration (FDA) has not approved insulin-sensitizing medications, such as metformin (pronounced *met-FAWR-min*), specifically for treating PCOS. Even so, your health care provider may use these medications to treat your symptoms. Talk to your health care provider about any concerns you may have about these medications.<sup>13</sup>

## Anti-androgens

These medications either prevent the body from making androgens or limit the activities or effects of those hormones. In women with PCOS, anti-androgens can:

- Lower androgen levels
- Reduce excess hair growth
- Help clear acne

Because anti-androgens can cause birth defects, they are often taken with oral contraceptives to prevent pregnancy.<sup>14</sup> Be sure to talk with your health care provider about the risks of these treatments, especially if you want to become pregnant.

As with insulin-sensitizing medications, anti-androgens are not approved by the FDA for the treatment of PCOS. At this time the best type of anti-androgen for treating PCOS symptoms is not known.

## Removing or Hiding Unwanted Hair

There are many ways to remove excess or unwanted hair or to hide this hair without actually removing it. Women with PCOS can use the methods below instead of or in combination with other approaches:<sup>13</sup>

- Daily application of an eflornithine (pronounced *ee-FLOOR-nih-theen*) cream slows hair growth, especially on the face. This drug works by blocking an enzyme that is needed by hair to grow. If you stop using the cream, the hair will grow back, and so you should talk to your health care provider about a long-term management plan.
  - Eflornithine is FDA-approved for the treatment of unwanted facial hair, but no studies have been published about its use specifically in women with PCOS.<sup>13</sup>
  - This cream should not be used in pregnant women, and thus you should talk to your health care provider about its risks and benefits before using it, especially if you want to get pregnant.<sup>13</sup>
- Shaving, bleaching, plucking, waxing, and using depilatories (creams that dissolve hair, pronounced *dih-PIL-uh-tawr-ees*) are some of the more common ways of removing or hiding unwanted hair. Some of these methods, such as shaving and plucking, are associated with skin irritation and the development of ingrown hairs.
- Electrolysis (pronounced *ih-lek-TROL-uh-sis*) and laser hair removal are other options, but they are often expensive and may require multiple treatments.<sup>1</sup> Electrolysis uses an electric current applied to each hair follicle to destroy its root. Laser hair removal involves shooting a laser beam at each hair follicle to destroy its root.

## Acne Treatments

Retinoids (pronounced *RET-n-oids*), antibacterial agents, and antibiotics may be used to treat acne. These products may be available in pills, creams, or gels. The specific treatment depends on the severity of the acne and how long it has been visible. Because retinoids can cause birth defects, you should not use them if you want to become pregnant.<sup>1</sup>

## Treatments for Infertility Resulting from PCOS

In most cases, fertility problems in women with PCOS result from the absence of ovulation (anovulation), but anovulation may not be the only reason for these problems. Before beginning treatment for infertility possibly related to PCOS, be sure that your health care provider rules out other causes.<sup>1</sup>

Lifestyle changes, such as losing weight, can trigger body changes that facilitate conception in women with PCOS.<sup>2,3</sup> Your health care provider may recommend that you try weight loss and other lifestyle changes before trying any medications to see if fertility returns and pregnancy occurs naturally. Research shows that lifestyle changes can help restore ovulation and improve pregnancy rates among women with PCOS.<sup>3,4</sup> In one study of 11 women with PCOS who had menstrual dysfunction and lost more than 5% of their initial weight, nine either became pregnant or had their menstrual cycles become more regular.<sup>5</sup>

If you have PCOS-related infertility, your health care provider may prescribe one of the following medications to help you get pregnant:

- **Clomiphene (pronounced *KLOM-uh-feen*), or clomiphene citrate**
  - This is the most common treatment for infertility in women with PCOS.<sup>1</sup> The American College of Obstetricians and Gynecologists (ACOG) recommends that clomiphene should be the primary medication for PCOS patients with infertility.
  - Clomiphene indirectly causes eggs to mature and be released.<sup>6</sup>
  - Women treated with clomiphene are more likely to have twins or triplets than women who get pregnant naturally. One in 10 women who conceive with the aid of clomiphene will have a multiple pregnancy, most commonly twins.<sup>7</sup>
- **Metformin (pronounced *met-FAWR-min*)**
  - Although this insulin-sensitizing drug is normally used to treat diabetes, it may also be used as an adjunct to increase or regulate ovulation in women with PCOS.
  - Metformin can be used alone<sup>8</sup> or used with clomiphene when clomiphene alone is not successful.<sup>2,3</sup>
  - Evidence shows that metformin—both alone and in combination with clomiphene—increases ovulation, but it does not increase the rate of pregnancy.<sup>9</sup>
  - Metformin is not approved by the FDA for treating PCOS-related infertility.
- **Letrozole (pronounced *LET-roh-zoh*)**
  - This drug transiently slows estrogen production and causes the body to make more follicle-stimulating hormone (FSH), a hormone needed for ovulation.<sup>10</sup>
  - Letrozole is as effective as clomiphene in causing ovulation,<sup>11</sup> but it is still not known whether it improves pregnancy and live-birth rates.<sup>10</sup>
  - The NICHD currently is doing studies to compare the safety and effectiveness of letrozole with clomiphene for treating infertility related to PCOS.
  - Studies of letrozole in animals have shown that it causes birth defects if used during pregnancy, but there have been no studies of this drug in pregnant women.<sup>10,12</sup>

If you do not get pregnant with these first-line medications, your health care provider may suggest one of the following treatments:<sup>10,4</sup>

- **Gonadotropins (pronounced *goh-nad-uh-TROH-pins*)**

- These hormones, given as shots, cause ovulation.
- This treatment is costly and has a higher risk of multiple pregnancies than does treatment with clomiphene.<sup>4</sup>
- Your health care provider may need to use frequent laboratory tests and ultrasound exams to watch how your body responds to this treatment.<sup>4</sup>
- **Ovarian drilling**
  - This surgery may increase the chance of ovulation<sup>13</sup> and may be considered if lifestyle changes and medications have been used without success.
  - In ovarian drilling the surgeon makes a small cut in your abdomen and inserts a long, thin tool called a laparoscope (pronounced *LAP-er-uh-skohp*). The surgeon then uses a needle with electric current to puncture and destroy a small part of the ovary. The surgery leads to lower androgen levels, which may improve ovulation.
  - This surgery may be less costly than treatment with gonadotropin,<sup>14</sup> and it does not seem to increase the risk of multiple pregnancies.<sup>15</sup> However, it does carry the risk of scarring the ovaries.<sup>8</sup>
  - This treatment is not recommended by all professional societies. It is unclear whether the process is more effective than medications for treating PCOS infertility.

If you do not get pregnant with the treatments listed above, your health care provider may suggest **in vitro fertilization**, or IVF.<sup>16</sup> In this procedure, sperm and an egg are placed in a dish outside the body, in which fertilization occurs. Then a doctor places the fertilized egg into the uterus. IVF may offer women with PCOS the best chance of getting pregnant, and it may give health care providers better control over the risk of multiple births. But it can be expensive and may not be covered by health care insurance.<sup>12</sup>

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