

Polycystic Ovarian Syndrome

By Bethany Stricker

Polycystic ovarian Syndrome (PCOS) is a common syndrome with potential causes that are not very well understood. We know the risks and long term health consequences that are associated with PCOS, although the idea of preventing those consequences, restoring health and fertility in the short term and dissipating symptoms of the disease entirely is not touted to be an option in a large part of the medical world. Ongoing study and research will reveal what PCOS is on the chemical level in the body, potential causes of PCOS, risks of having PCOS in the long term, how it is diagnosed, and how it is treated using allopathic medicine and alternative medicine.

I. What PCOS is

PCOS is defined as sex hormone imbalance and hyperandrogenism, the presence of enlarged ovaries from ovarian cysts, and obesity from insulin resistance. These pathologies in the body lead to infrequent or irregular menstrual cycles, anovulation, infertility, miscarriage, hirsutism, acne or dandruff, cravings, weight gain, male-pattern baldness or thinning hair, pelvic pain, anxiety, depression and fatigue. ("Polycystic topic Overview") ("Publications") (Pick) PCOS is the most common reproductive disorder in women of reproductive age as it affects between 1 in 10 and 1 in 20 women or statistically five million women in the United States. ("Publications") (Hywood and Romm, 176)

Pathologically, 80% of women with PCOS have hyperinsulinemia where they overproduce insulin. This leads to insulin resistance over time which in turn stimulates the production of androgens, like testosterone, in the ovaries. It is not known why the ovaries produce more androgens when more insulin is present, but it is known that the ovaries function better when the presence of insulin is reduced.

Excess androgens disrupt the cyclical hormone balance in women resulting in male pattern hair growth, like hirsutism, and hair loss. In addition, excess androgens are converted to estrogen but excess estrogen suppresses the surge of follicle-stimulating hormone (FSH) that the body needs to ovulate.

When ovulation does not occur, called anovulation, unreleased ova are present in the ovaries which then form small cysts. Without ovulation, luteinizing hormone (LH) remains high and produces even more androgens. Normally, LH peaks with ovulation and then falls for progesterone to rise and maintain a pregnancy, or when the ovum is not fertilized, progesterone then falls again to trigger menstruation. LH does not fall at its cyclical time for women with PCOS resulting in low progesterone levels and consequently, irregular or absent menstruation. If the ovum is fertilized and if low progesterone levels continue, miscarriage results.

II. Potential Causes

Potential causes for this hormone imbalance resulting in PCOS and the associated symptoms are multiple. Scientific research and ongoing studies have found PCOS to be linked to genetic

predisposition, insulin resistance, obesity and environmental factors like diet and pollution. It is common for medical authorities to say that “the cause for PCOS is unknown” yet, at this time we have many theories. What should be said is that the exact cause for *all* cases of PCOS is unknown. Because PCOS is a syndrome, not a disease, it is possible and logical that causative factors are different in every woman, just as PCOS symptoms and their severity are different in every woman but still resulting in PCOS in some form.

A. Genetic Predisposition

A study from London linked the insulin gene class III alleles in the mini-satellite region of the insulin gene to PCOS (Frank S. London), because it not only determines the predisposition to anovulatory PCOS but also the risk for type 2 diabetes. The insulin receptors in PCOS women are normal, but the serine phosphorylation are abnormal in the receptor which may impair the transduction signal accounting for a post-binding defect in insulin action. A study from Poland revealed that a polymorphism, specifically the absence of four-repeat-unit allele, in the regulatory region of CYP11A gene has been associated with the insulin resistant component of PCOS. (Jakubawski and Frank)

Interestingly, a study from Sweden puts it all together saying that the genes which differ from women without PCOS are just “thrifty.” They are such that they are an advantage in times of shortage of nutrition because they result in more muscle mass, fat storage, decreased insulin sensitivity, and have an energy saving constitution. The issue is that in a culture with an unlimited food supply and sedentary lifestyle, these hunter-gatherer genes result in full blown insulin resistance and infertility. (Holte)

B. Insulin Resistance

It is estimated that at least 30% of women with PCOS, if not 50%, have insulin resistance. Cells that are less responsive to the insulin hormone are insulin-resistant and have a reduced ability to receive blood sugar, to burn fat, and to regulate the liver’s production of blood sugar. Because of this, the pancreas works harder to produce more insulin to combat the resistance. Two things happen as consequence. First, the high levels of insulin in the blood stimulate the ovaries to produce androgens like testosterone. This leads to hyperinsulemic hyperandrogenism, which tends to increase insulin levels, making a cycle that feeds on each other. Hyperinsulinemic hyperandrogenism increases insulin levels while elevated insulin levels increase insulin and androgen production. One or the other must be stopped to halt the destructive cycle. Secondly, if the pancreas is over taxed from this harmful cycle, diabetes and obesity, if not already issues, are a result. Insulin resistance is a leading cause of PCOS, its symptoms and the long term risk factors, like obesity and diabetes, that go along with PCOS. (Pick) (Sozen and Aricia) (Book and Dunaif) **See figure 1.**

C. Obesity

In addition to genetic predisposition and insulin resistance, obesity can be a potential cause for PCOS. Excess weight or adipose tissue hold elevated plasma levels of androgen precursors. Extra fat cells also fuel production of estrogen which disrupts ovulation and menstruation and produces more androgens, as discussed before, causing our PCOS symptoms. (“What causes”) Adipose tissue also releases fatty acids that impair beta-cell function and insulin sensitivity. (Whitaker)

Obesity produces immune cells that lead to chronic, low grade inflammation which increases insulin resistance. (Kaaks, et al) A study from Slovakia looked at obese PCOS women in particular and determined that obesity directly contributes to hyperinsulinism and hyperandrogenism. (Dravecka, et al) Although, another study determined that lean women with PCOS did not show a significant metabolic difference from obese PCOS women. (Faloia, et al) Early onset obesity in female adolescents with other risk factors, like genetic predisposition, has been shown to be a critical cue for the clinical manifestations of PCOS. (Diamanti-Kandarakis, et al. "Early") **See figure 2.**

D. Diet

Other scientists and researchers have the idea that diet alone can be a precursor and cause of insulin resistance and consequently hyperinsulinism and hyperandrogenism resulting in obesity and PCOS. Insulin resistance was a survival mechanism before the advent of the industrial revolution when the diet was high in protein and low in carbohydrates. At the time of agricultural dominance and the wane of hunter-gatherer populations, the dietary consumption increased but still it was high quality with a low glycemic index that made little impact on plasma insulin. Once the industrial revolution occurred, the quality of the carbohydrates changed to have less fiber with a higher glycemic index. This increased insulin responses by two to three fold compared to the whole grains and coarsely ground fiber that were dominant before the industrial revolution. (Colagiuri and Miller) Many of our modern-day diseases are a result of insulin resistance from our diet. PCOS may be one of those diseases. (O'dea) (Kelly) (Mavropoulos, et al)

E. Gut Dysbiosis

Knowing that polycystic ovarian syndrome is characterized by chronic inflammation and insulin resistance, scientists seek to find the cause for these two key disturbances. In a 2012 study from Australia, it was found that disturbances in bowel bacterial flora from a poor diet (and presumably prescription drugs and antibiotics also) increased gut mucosal permeability. This resulted in the increased passage of lipopolysaccharide (LPS) from gram negative colonic bacteria into systemic circulation. Consequently, the immune system is alerted to the foreign matter and interferes with insulin receptor levels with driving up serum insulin levels. This, as we know, increases the ovaries' production of androgens and interferes with normal follicle development, creating small cysts on the ovaries. In this way, the Gut Dysbiosis Theory of Gut Microbiota (DOGMA) can explain the reason for insulin resistance and all three components of polycystic ovarian syndrome including anovulation and menstrual irregularity, hyper-androgenism with acne and hirsutism, and the development of multiple small cysts on the ovaries. (Tremellen and Pearce)

To support this study, other studies have found that lean people have a different ratio of gut flora compared to obese people, with lean people having a 20% population of Bacteroides group microbes and obese people having a 5% population. Another study showed that gut flora disturbance preceded children becoming overweight. The children with a greater percentage of bifidobacteria remained at a normal weight and obese children had half the amount compared to their lean counterparts. (Seccombe) These findings prove that the DOGMA causes obesity and insulin resistance leading to polycystic ovarian syndrome.

F. Excitotoxins

Excitotoxins like aspartame, glutamate, hydrolyzed vegetable protein (HPV), and monosodium glutamate (MSG) are amino acids that react with specific receptors in the brain to eventually lead to destruction of certain types of brain cells. Aspartame occurs naturally in some fruits in very small amounts and glutamate is found in the brain in very small amounts, no more than 8-12 ugs. The issue is that when the concentration of these substances rises above the normal level that the neurons can handle, the neurons start to fire abnormally to the point where they become exhausted and can possibly die. The blood-brain barrier's function is to protect the brain's cells from concentrated substances such as these, but studies have found that daily exposure, several times a day at each meal, causes glutamate to by-pass the blood-brain barrier all together.

Nerve cells in the hypothalamus in particular are very sensitive to excitotoxins. Ironically, the hypothalamus is a collection of specialized nerve cells that are linked to the endocrine and nervous system which control the pituitary gland. The pituitary gland is responsible for hormone secretion. When the hypothalamus is damaged, the body's ability to regulate hormones is also impaired. (Blaylock)

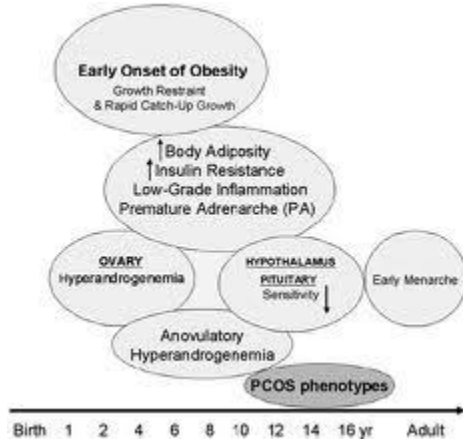
In a study of female rats, MSG was administered when they were very young. The results showed that ovarian and pituitary gland weights were significantly reduced and ovarian cyclicity after puberty was non-existent or disrupted. (Inkster, et al) In another study, MSG was given to rats and showed that the hypothalamic-pituitary-gonadal axis feedback mechanisms were disrupted and affected sex hormones in both the males and females. (Nemeroff, et al)

G. Environmental Pollution

Environmental pollution is becoming a grave concern in the medical community. Environmental toxicants have hormone-like activity and are toxic to the endocrine system, leading many to theorize that our toxic environment could directly affect and alter human reproductive function and fertility. (Foster) (Crinnion) Some chemicals have estrogen-like effects, while others suppress estrogen function, and still others affect testosterone, progesterone, insulin, and thyroid function. Animal studies show that PCBs reduce progesterone levels by accelerating the breakdown of the liver. Other studies on the cultures of human ovary cells showed that many chemicals damage ovarian follicles, making them unable to produce hormones. Consequently, these follicles cannot be the prerequisite to a normal ovulatory cycle. (Lovekamp-Swan and Davis) (Ptak, et al) (Hoyer) (Windham, et al) (Gauger, et al)

H. Genes and Environmental Factors

The Department of Reproductive Science and Medicine at the Imperial College School of Medicine in London conducted a study and came to the conclusion that "PCOS is an oligogenic disorder in which a small number of key genes interact with environmental factors (notably dietary), the balance of which factors determine, the typically heterogeneous, clinical and biochemical phenotype." (Franks, et al)



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III. Risks and long term health complications from PCOS

Polycystic Ovary Syndrome is a complicated disorder with many effects on the body, just as it has many potential causes. Insulin resistance and hormone imbalance create many symptoms in a woman's body. The symptoms of PCOS are the signs of the syndrome but also signs of the risks and long term health complications that can come with PCOS. Syndrome X, diabetes, obesity, cardiovascular disease, hypertension, infertility, higher rate of miscarriage, cancer, seizure disorders, and the risks that family members now have because one of their relations has PCOS, are all potential implications that come with PCOS.

1. Syndrome X

Syndrome X, also called metabolic syndrome, glucose intolerance, insulin resistance or pre-diabetes is common in PCOS women before they develop diabetes, if they have not already. Syndrome X is a group of conditions that puts a person at further risk for cardiovascular disease and diabetes. This syndrome includes conditions like hypertension, hyperglycemia, high levels of triglycerides, low levels of HDL, and abdominal adiposity. It is thought that insulin resistance causes Syndrome X with smoking, lack of physical activity and a poor diet affecting risk further. (Nelson) ("Metabolic") PCOS women with Syndrome X generally have a hard time losing weight and have increased risk for cardiovascular disease. (Galluzzo, et al)

2. Diabetes

PCOS is associated with a three-fold higher risk of subsequent incident diabetes and dyslipidemia, independent of BMI, age and race, (Legro, et al) (Ehrmann, et al) compared to women without PCOS. The risk of contracting diabetes may be greatest for women with persistent PCOS symptoms. (Wang, et al) Hyperinsulinemia in PCOS women leads to this high risk of diabetes and is a risk factor for gestational diabetes. (De Leo, et al) A study from Finland showed that 20% of PCOS patients compared to 8.9% of controls developed gestational diabetes. (Mikola, et al) A study from Boston, Massachusetts showed that women with long or irregular menstrual cycles have an increased risk of developing Type 2 diabetes that is not completely explained by obesity. (Soloman, et al)

3. **Obesity**

50% of women with PCOS are overweight or obese. Obesity may be the cause of PCOS for some women and for others, PCOS causes their weight problems. (Gambineri, et al) Obesity has been linked to ovarian hyperandrogenism and hyperinsulinemia. (Kaaks, et al) Abdominal adiposity in particular has been linked to insulin resistance and consequently hyperinsulinemia in PCOS women. Women with PCOS that are obese have insulin resistance and hyperinsulinemia symptoms of a greater magnitude. (Salehi, et al) It is a matter of debate whether PCOS is secondary to obesity and insulin resistance or if hyperandrogenism causes obesity, insulin resistance and hyperinsulinemia. (Orio, et al) **See figure 2.**

4. **Cardiovascular Disease**

Since women with PCOS often develop diabetes, hypertension, dyslipidemia and hypertension, they are automatically at an increased risk for cardiovascular disease also. (Christian, et al) Studies show that women with PCOS have an increased risk of cardiovascular disease because of the presence of oligomenorrhea and/or hirsutism, but especially in the presence of both, also. (Taponen, et al) Young PCOS women have an increased diastolic dysfunction and left ventricular mass (LVM) which are not dependent on weight, making PCOS women early candidates for cardiovascular disease. (Orio, et al) Recent studies have shown that even though risk factors are apparent in PCOS women, morbidity, mortality and pre and post-menopausal cardiovascular events from cardiovascular disease were not as high as expected or previously predicted. (Wild, et al) (Schmidt, et al)

5. **Hypertension**

Because of the obesity, hyperinsulinemia and dyslipidaemia associated with PCOS, women with PCOS also have a higher risk of hypertension. (Elting, et al) (Velasquez)

6. **Infertility, Miscarriage, and Preterm Labor and Birth**

Women with PCOS have a much higher rate of infertility from oligo/anovulation and amenorrhea. When conception does occur, they also have a much higher rate of miscarriage. There are several factors that can contribute to miscarriage in women with PCOS, including abnormal luteinizing hormone (LH) levels, luteal phase defects, insulin resistance, cystic ovaries and endometrial dysfunction.

PCOS causes higher than normal levels of luteinizing hormone (LH) from the hormone imbalance discussed previously. 81% of women with recurrent loss have abnormal LH levels. This predisposes PCOS women to a higher likelihood of miscarriage. In women with recurrent loss, abnormal LH levels were highest in the luteal phase. LH may have adverse effects on the endometrium and developing oocyte, directly or indirectly, by causing an elevation in testosterone and estrogen. (Watson, et al) When LH is elevated in the follicular phase, the ovum detaches prematurely, causing an interruption in maturation, leading to a possibility of abnormal chromosomes and increased probability of miscarriage. (“Miscarriage”)(“Treatment”)

When ovulation is not a problem, a luteal phase defect may be for PCOS women. Because women with PCOS often have high levels of estrogen, they also may not have a strong surge of FSH

or may not react efficiently to its signaling. FSH is required for follicle development and development is inadequate when FSH is inadequate. Once the follicle releases the ovum, the follicle is converted to the corpus luteum which produces the progesterone required for the thickening of the endometrium and successful implantation. When FSH is inadequate, the follicle is poor, the corpus luteum is poor and progesterone is not adequate for a healthy endometrium and pregnancy. This is called a luteal phase defect as it all occurs in the luteal phase after ovulation. (“Miscarriage”)

High insulin levels in the blood from insulin resistance stimulates further production of LH and testosterone. Excessive levels of insulin, LH and testosterone are associated with poorer ovum quality and recurrent pregnancy loss. (“Miscarriage”) (“Treatment”)

Cystic ovaries have been shown to predispose women to miscarriage. In one study of 21 women with recurrent early pregnancy loss, 81% had polycystic ovaries. Only one woman out of ten control subjects had polycystic ovaries. (Watson, et al) (“Treatment”)

Endometrial dysfunction is an issue with PCOS women because androgen receptors and steroid receptor co-activators are over-expressed, biomarkers of endometrial receptivity to embryonic implantation-such as alpha(v)beta3-integrin and glycodeclin-are decreased, and epithelial expression of estrogen receptor alpha (ERalpha) abnormally persists in the window of implantation in endometrium in women with PCOS. Additionally, the endometrium is a target for insulin. Insulin is usually regulated cyclically in normal ovulatory women, but in PCOS women, too much insulin inhibits normal endometrial stromal differentiation or decidualization. (Giudice) In these ways, PCOS adds to the risk of miscarriage.

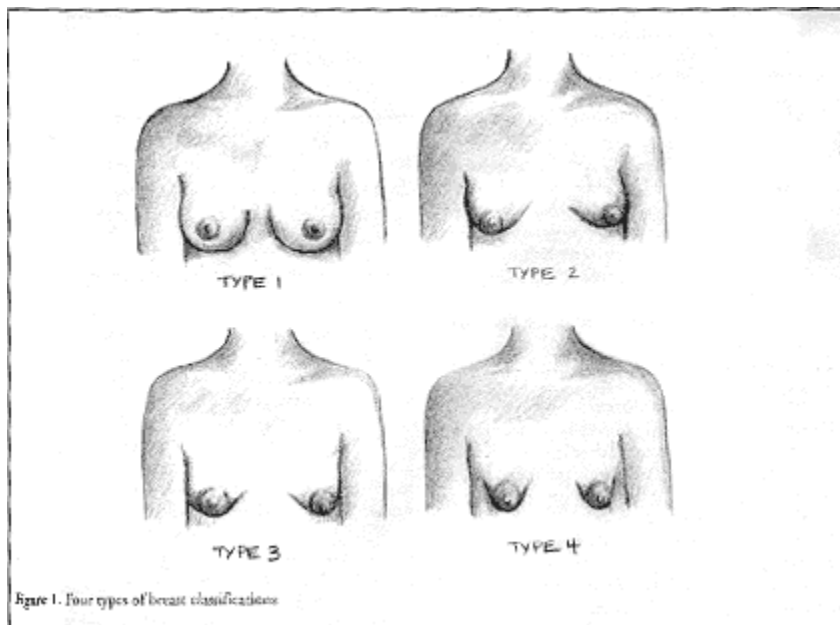
Women with PCOS have a higher risk of preterm labor and birth according to the Journal of Perinatology, “Among 908 PCOS women with singleton pregnancy, 12.9% delivered preterm compared with 7.4% among non-PCOS women ($P < 0.01$). Causes of preterm delivery among PCOS women included preterm labor (41%), cervical insufficiency (11%), hypertensive complications (20%), preterm premature rupture of membranes (15%), fetal-placental concerns (9%) and intrauterine fetal demise (5%). Maternal age, race/ethnicity and nulliparity were significant predictors of preterm delivery in PCOS, whereas body mass index and fertility medications were not.” (Yamamoto, et al) A study from Finland reported that there was no difference in Apgar scores, birth weights or perinatal morbidity for women with PCOS compared to the control group. They concluded from the study that PCOS has a slightly higher risk for gestational diabetes but not for preterm delivery or preeclampsia. (Mikola, et al)

7. **Breastfeeding**

For PCOS women who conceive and carry a baby to term, there are several factors that may make exclusive breastfeeding a challenge. The doctors who discovered and gave PCOS its name noted breastfeeding issues with their PCOS patients. Anecdotally, mothers report more breastfeeding trouble when they themselves have PCOS compared to their non-PCOS counterparts. (Marasco) In a casual survey of 39 mothers in PCOS support groups online, 67% reported sufficient milk supply while 33% reported an inadequate milk supply. 1 out of 5 mothers with sufficient milk supply reported problematic overproduction. (Childers) There are several reasons inadequate milk supply may occur including hypoplasia of the mammary glands, low progesterone, abnormal prolactin and androgen levels, and insulin resistance. (Marasco)

Hypoplasia of the breast, specifically the glands, and a tendency towards primarily fatty internal tissue as opposed to a normal amount of glandular tissue, will predispose women to a challenged ability to lactate even when latch, nutrition, and birth practices are adequate. (See figure. *Type 1 normal breasts. Type 2-4 examples of hypoplasia*) Some women have little or no breast growth during pregnancy and those with early onset of the syndrome in adolescents are more likely to have hypoplasia of the breast. (Marasco) Hypoplasia of the breasts in PCOS women is thought to be from inadequate progesterone during the developmental period in adolescents because progesterone is required for alveolar growth. Another cause may be high androgen levels which interfere with estrogen and prolactin receptors, hormones that are both required for lactation. Even with adequate hormones like prolactin, androgen levels that are too high can interfere with breast tissue and thus lactation. (Childers)

Women with high estrogen levels may have insufficient milk supply because estrogen is a known inhibitor of milk production. High levels of insulin and women with uncontrolled diabetes mellitus will have trouble with lactation. (Childers) Women with high prolactin levels are generally the women with excess milk supply. (Cassar-Uhl)



[picture credit](#)

8. Cancer

Women with PCOS have a higher risk of endometrial cancer. Risk factors for endometrial cancer include hirsutism, hyperandrogenism, ovarian cysts, adrenocortical hyperfunction, chronic hyperinsulinemia, obesity, diabetes, hypertension, nulliparity, infertility, and oral contraception. (Gerber, et al) (Dahlgren, et al) (Kaaks, et al) Greater than 40% of the incidence of endometrial cancer was contributed to excess body weight and another large percentage to physical inactivity. (Kaaks, et al) Cigarette smoking reduced the risk of endometrial cancer because it had an anti-estrogenic effect on the unopposed estrogen associated with the endometrial cancer risk factors listed. (Dahlgren, et al)

9. Liver disease

Women with PCOS are at a higher risk of non-alcoholic fatty liver disease (NAFLD) because PCOS and NAFLD share causative factors such as insulin resistance-related disorders like Type 2 diabetes, weight gain, poor diet or associated illnesses like tuberculosis. Abnormal alanine aminotransferase (ALT), which is an indicator for NAFLD, was found in 30% of 70 infertile women with PCOS when causes other than NAFLD were excluded by history and serum testing. There was also a significant link between hirsutism and higher ALT levels in the blood stream. The women with abnormal ALT levels also had significantly higher body mass index, waist circumference, serum triglycerides, total cholesterol-to-HDL-cholesterol ratio, and degree of insulin resistance. Researchers came to the conclusion that insulin resistance explains the high rate of ALT in the blood stream. (“PCOS and non-alcoholic”) (Schwimmer, et al)

10. Risks for related family members

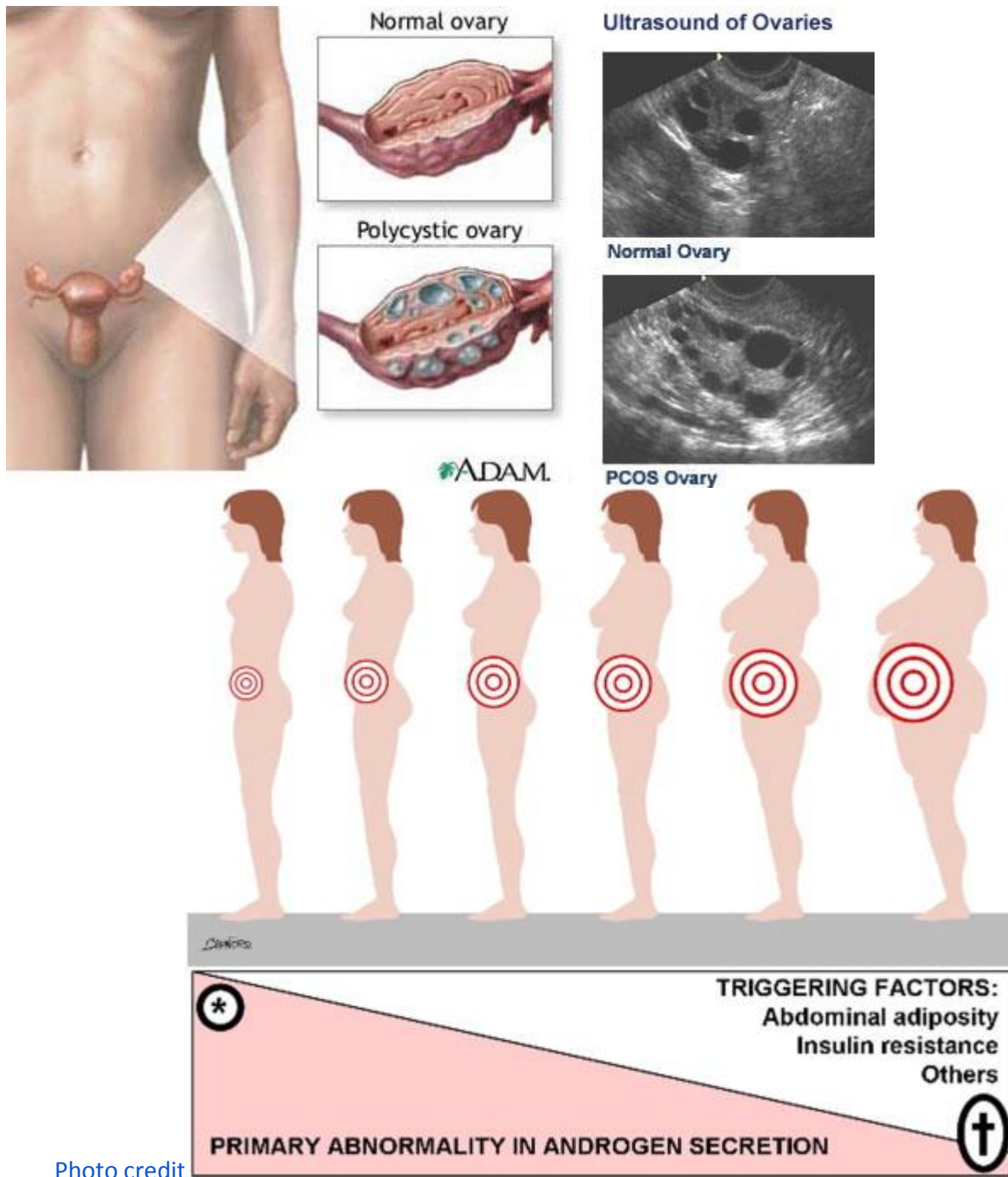
A study that compared children of PCOS women and children of women who did not have PCOS, found that both hyperandrogenism and insulin resistance are family traits that may cluster in children whose mothers have PCOS. It also found that reproductive abnormalities, characteristic of PCOS, do not develop in girls of the PCOS women until the later stages of puberty or later in life. (Kent, et al) A study from Turkey found that first degree relatives of patients with PCOS may be at high risk for diabetes and glucose intolerance; female family members of PCOS women have insulin resistance; and mothers and sisters of PCOS patients have higher androgen levels than control subjects. (Yidiz, et al)

IV. How it is diagnosed

Symptoms

Polycystic ovarian syndrome is diagnosed when patients report symptoms to a medical professional who then performs testing to confirm that PCOS is the present pathological condition. Symptoms from PCOS include menstrual cycle irregularity, lack of ovulation, break-through ovulation pain, infertility, hirsutism, male pattern hair growth and hair loss, obesity or inability to lose weight, predominance toward abdominal adiposity, sleep apnea and fatigue, depression, acne, dandruff, oily skin, and skin tags. All of these symptoms show cause to hyperinsulinemia and hyperandrogenism.

Specifically, insulin resistance provokes depression, sleep apnea, fatigue tendency towards abdominal adiposity, and inability to lose weight. Hyperandrogenism is responsible for menstrual cycle irregularity, lack of ovulation, infertility, hirsutism, male pattern hair growth and loss, depression, acne, dandruff, oily skin and skin tags. Ovarian cysts from hyperandrogenism cause breakthrough ovulation pain. With insulin resistance encouraging the ovaries to produce more androgens, hyperandrogenism and hyperinsulinemia are a cycle that feed each other and the symptoms of PCOS. (Strowitzki, et al) (Evans, et al) (Vgontzas, et al) (Rasgon, et al) (Timonen, et al) (“Acne and PCOS”)



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A. Tests

Testing for PCOS is important because even if some of the above symptoms are present, other medical conditions like pituitary tumors, (A.D.A.M.) endometriosis, and adrenal thyroid problems may be present and be causing the same or similar symptoms. Obviously, menopause and

pregnancy can disrupt menstruation also. Ultrasound is used to test for ovarian cysts. Blood tests check hormone levels and glucose levels. Saliva testing can also check hormone levels. (American)

1. **Ultrasound**

Ultrasound technology is used to detect ovarian cysts through sound waves producing an image on an ultrasound machine. Transvaginal ultrasound produces the best picture of a woman's reproductive organs. A hand-held cylinder-shaped instrument called a transducer is placed inside the vagina. This ultrasound probe emits sound waves for the ultrasound technician to measure the ovaries and determine if they are enlarged or have any cysts. Enlarged ovaries usually indicate inflammation and small cysts that cluster around the edge of the ovaries, called a "pearl necklace." A normal ovary has a more consistent appearance with some scattered follicles. (Wedro) (Boss, Sterling, Legro, 52-53)

2. **Blood test**

Hormones tested by blood test or saliva test include luteinizing hormone (LH), follicle-stimulating hormone (FSH), testosterone, DHEAS, prolactin, androstenedione, progesterone, estrogen, thyroid-stimulating hormone (TSH), and glucose.

Because hormone levels vary greatly from woman to woman, PCOS women don't always have the same symptoms and women who are in the "normal" range hormonally may have PCOS. This is especially true for testosterone, DHEAS and LH levels, because even small changes in these hormones can cause PCOS symptoms. Each lab sets their own "normal" values and ranges, so many PCOS women may be "normal." (Galan, "Going") (Boss, Sterling and Legro, 43-52)

Luteinizing hormone and follicle-stimulating hormone are secreted by the pituitary gland in the brain and are responsible for ovulation. LH and FSH are about equal at the beginning of the menstrual cycle. Around 24 hours before ovulation occurs, there is a surge of LH that causes the ovum to be released from the ovary. The LH level then goes back down to its pre-sure level. Many women with PCOS have elevated LH levels which, when not equal with FSH, are enough to disrupt ovulation. LH and FSH can be in "normal" range but the ratio of LH and FSH is what is important. Two or three times more LH compared to FSH is called an elevated LH to FSH ratio. The normal range for FSH on cycle day 3 is 3-20mIU/ml and 19-28 mIU/ml on Cycle Day 10 or about twice the Day 3 level. The normal range for LH on cycle day 3 is 5-20 mIU/ml and 25-40 mIU/ml when ovulation occurs. LH and FSH should be roughly equal on Day 3 at the beginning of the cycle and LH should surge to induce ovulation. If LH is elevated at the beginning of the cycle and does not surge, ovulation is disrupted. (Galan, "Going") (Boss, Sterling and Legro, 43-52)

Testosterone is present in all women, but even a slight increase can suppress normal menstruation and ovulation, and create other PCOS symptoms. Some women with PCOS are in the "normal" range for testosterone but are on the high end of average *Total testosterone* can be measured and is the total amount circulating in the body that is bound to sex hormone binding globulin (SHBG). About 2% of the testosterone in your body is *free testosterone* and it can be measured also and is not bound to SHBG. *Free testosterone* is the testosterone that is biologically active and has the ability to permeate a cell and activate its receptors. This testosterone is the hormone that contributes to PCOS symptoms like hair loss, hirsutism, and acne. Normal range for

total testosterone is 6.0 -86 ng/dl and is usually greater than 40 ng/ml in PCOS women. The normal range for free testosterone is less than 5 pg/ml and is usually elevated in PCOS women. (Galan, "Going") (Boss, Sterling and Legro, 43-52) (Delia)

DHEAS or dehydroepiandrosterone sulfate is excreted by the adrenal gland and is another male hormone or androgen that women produce in their bodies. Again, high levels of this hormone and even higher limits in the "normal" range can contribute to PCOS symptoms like hirsutism and abdominal adiposity. The normal range of DHEAS is 35-430 ug/dl and usually greater than 200 ug/dl in PCOS women. (Galan, "Going") (Boss, Sterling and Legro, 43-52) ("DHEA sulfate")

Prolactin is the hormone that stimulates milk production in lactating women. Women who are being tested for PCOS should have their prolactin levels checked also in order to rule out a pituitary tumor, or prolactinoma, which causes high levels of prolactin and also exhibits PCOS symptoms like infertility and irregular menstruation. The normal range for prolactin is 25 ng/ml and slightly elevated levels would be 25-40 ng/ml. (Galan, "Going") (Boss, Sterling and Legro, 43-52) (A.D.A.M.)

Androstenedione (ANDRO) is a male hormone or androgen present in women's bodies and produced in the adrenal glands and ovaries. When levels are high, ANDRO can contribute to PCOS symptoms just like testosterone and DHEAS while not as potent as testosterone and more potent than DHEAS. Normal levels for ANDRO are 0.7-3.1 ng/ml and are usually elevated above that for women with PCOS. (Boss, Sterling and Legro, 43-52)

Progesterone is secreted by the corpus luteum after ovulation occurs to signal the uterine lining to thicken for potential implantation. Testing for progesterone can determine if a woman is ovulating even if she has signs that she is already and assist with infertility or habitual miscarriage. Normal levels of progesterone on cycle day 21 (or 7 days past ovulation) are greater than 14 ng/ml and if ovulation is occurring, they will be normal. (Boss, Sterling and Legro, 43-52) ("Progesterone")

Estrogen is a female hormone that is mainly secreted by the ovaries and the adrenal glands in small quantities. This hormone is vital in concert with progesterone for menstruation to occur. Some refer to estrogen as *estradiol* because the most active estrogen in the body is called *estradiol*. Androgens are often converted to estrogen in PCOS women, so it is common for PCOS women to have estrogen levels within "normal" or high levels. The normal range for estrogen is 25-75 pg/ml on cycle day 3 and is usually normal in PCOS women. (Boss, Sterling and Legro, 43-52)

Thyroid-Stimulating hormone (TSH) is produced in the thyroid gland and is checked to rule out pathology such as underactive or overactive thyroid which can cause irregular or absent periods and anovulation also. The normal range for TSH is 0.4-5.0 uIU/ml. (Galan, "Going") (Boss, Sterling and Legro, 43-52)

3. Saliva testing

Saliva testing is a World Health Organization approved accurate and simple way to test steroid hormones in a noninvasive, economical way. 95-99% of steroid hormones are bound to carrier proteins called hormone-binding globulins or albumin. In this bound form, steroid hormones

are unable to target tissues and exert any changes on cells. Only the “free” unbound steroid hormones diffuse into tissues, including the salivary gland. Because of this, the hormone levels in saliva represent the unbound steroid hormones that can exert change on cells and produce symptoms of excess or deficiency, whether of testosterone, DHEA, progesterone or estrogen. Research has correlated salivary hormone levels with symptoms, and the accuracy of saliva testing has been clinically documented. (“About Saliva”) (Lee, Menopause, 299-301, 370)

V. Allopathic Treatment

Insulin Sensitizers

Prescription insulin sensitizers are aimed at the root cause of PCOS, elevated insulin levels and seek to effectively regulate and process insulin to combat PCOS symptoms. Originally prescribed to people with type II diabetes, PCOS women are also now treated with insulin sensitizers. Insulin sensitizers currently on the market and potentially prescribed for PCOS are metformin (glucophage), pioglitazone (ACTOS), rosiglitazone (Avandia), and troglitazone (Rezulin). These medications work for PCOS women who are insulin resistant by increasing the sensitivity of muscle cells to insulin. Thus, insulin sensitizers reduces insulin resistance, reduces the levels of insulin needed to control blood sugar levels, and reduces the production of testosterone from the ovaries because high levels of insulin tell the ovaries to produce more testosterone. In this way, lower, i.e. normal, testosterone levels for PCOS women manages hirsutism, irregular periods, anovulation and infertility. (Canvin) This is definitely a benefit for PCOS and women a good way to manage symptoms, if they so choose.

“One study, conducted in Finland, reported that improved insulin sensitivity achieved through a combination of diet and exercise reduced progression to type 2 diabetes by 58% over a 4 year period in obese men with impaired glucose tolerance.

More recently, an National Institutes of Health study of 3234 individuals at high risk for diabetes (*i.e.* presence of impaired glucose tolerance and first-degree relative with diabetes or history of gestational diabetes) was terminated early (*i.e.* after an average follow-up period of 3 yr) because intensive lifestyle intervention consisting of diet and exercise again reduced the risk of progression to type 2 diabetes by 58%. Notably, individuals treated with the insulin-sensitizing drug metformin experienced a 31% risk reduction in the development of diabetes. These outcome studies strongly suggest that improving insulin sensitivity in individuals at high risk, with lifestyle changes or drug, reduces the risk for developing diabetes.” (Diamanti-Kandarakis, et al) Note that lifestyle intervention consisting of diet and exercise reduced the development of diabetes almost 50% more than metformin alone.

A study from 2002 showed that insulin resistant women were ten times less likely to develop gestational diabetes when taking metformin during pregnancy compared to women who did not. (Glueck, et al)

Other benefits from insulin sensitizers include the ability to reduce miscarriage rates. “Roughly 9% of the women who took the drug miscarried (six of 65), compared with 42% of women who did not (13 of 31). Among the women in each group who had a history of miscarriage, the rate

of pregnancy loss was 11% for those receiving treatment and almost 60% for those not treated.” (Boyles)

According to the same 2002 study that showed metformin reduces the risk of gestational diabetes in pregnancy, “Metformin is presently classified as a category “B” risk in pregnancy, which indicates that there are no apparent fetal defects associated with its use in the late trimester of pregnancy, based on animal studies. Because the human effects of first-trimester use are unknown, discontinuation of therapy at the onset of pregnancy confirmation has been standard. However, a recent prospective study of women with PCOS who continued metformin therapy through the first trimester of pregnancy showed no evidence of fetal harm, calling into question this recommendation.” (Richardson)

PCOS women are more likely to develop breastfeeding issues, specifically low milk supply, due to their hormone imbalance. Metformin and or other herbs may help with this problem. (Danielsson) Practitioners who prescribe metformin for PCOS women with low milk supply have the best results when severe hypoplasia is not present and in conjunction with herbal galactagogues. Studies have shown that the passage of metformin through the breast milk to the baby is insignificant compared to the benefits of breast milk. (Marasco)

Insulin sensitizers may also reduce the risk of developing endometrial cancer. “While studies with insulin-sensitizing drugs are limited, they suggest that administration of these drugs is associated with substantially increased frequency of ovulation, followed by menstrual bleeding, resulting in at least six ovulatory menses per year in 55–85% of treated women. Although no prospective study focusing on prevention of endometrial cancer in PCOS by insulin-sensitizing drug has been conducted, this frequency of ovulation would be consistent with the current standard of care for the prevention of endometrial cancer in women with PCOS.

Furthermore, the theoretical possibility exists that ovulation induced by an insulin-sensitizing drug might be more successful in reducing endometrial cancer risk than a withdrawal bleed induced by exogenous progestins, because only the former may be associated with a multitude of physiological ovulation-induced hormonal events (*e.g.* local changes in endometrial growth factors) that may attenuate endometrial cancer risk.” (Diamanti-Kandarakis, et al)

Side effects from Metformin include gastrointestinal distress including diarrhea, flatulence, abdominal discomfort and indigestion, although the extended release version does not usually have gastrointestinal side effects of the same proportion. Some people report general malaise or a feeling of being unwell while on Metformin. Other side effects include nerve damage, vitamin B12 deficiency, hypoglycemia, hyperglycemia, and lactic acidosis, a rare condition where there is too much lactic acid in the bloodstream causing feeling tired or weak, difficulty in breathing, dizziness or lightheadedness, irregular heartbeat or tachycardia, shortness of breath, frequent nausea, abdominal pain, an enlarged or tender liver, and feeling cold, blue or cold hands and feet. The fact that metformin has also caused liver damage in some individuals is a point of controversy and should be considered for all that are considering taking it. Because PCOS women are more at risk for liver damage and disease, metformin may be adding more risk in this area. (“Metformin”) (“Metformin Warnings”) (“Metformin Side”)

Oral Contraceptives

Oral contraceptives are prescribed to women with PCOS that are not trying to conceive because of the symptoms that PCOS women have. One of the most common symptoms of PCOS, irregular menstruation, is managed through oral contraceptives. Acne and hirsutism may be managed with the long term use of oral contraceptives also. (Galan)

Biologically, the normal menstrual cycle is maintained by a feedback system of LH and FSH in response to varying levels of progesterone and estrogen. With oral contraceptives, the action of the hypothalamus and anterior pituitary is suppressed when sex hormones progesterone and estrogen are in excess, leading to insufficient FSH and LH for follicle maturation and ovulation. The hormone levels produced by oral contraceptives are similar to a state of early pregnancy, telling a woman's body to not ovulate. (Bennett and Pope) The estrogen in oral contraceptives also has an antifertility effect by altering the endometrium, making it less favorable for implantation. Progestins also create cervical mucus that is thick and virtually penetrable by sperm decreasing sperm penetration, transport and survival. These changes in the cervical fluid also renders sperm with an impaired ability to penetrate ovum. (Lowdermilk and Perry, 219) (Varney, et al, 513)

The mechanism of action in combination oral contraceptive pills is a team effort of the contraceptive actions of estrogens and progestins. There are three varieties of the combination pill available. Monophasic pills have the same amount and type of estrogen and progestin taken each day for 20 or 21 days followed by 7 days of no hormonal intake by placebo or sugar pills. Biphasic pills have the same amount and type of estrogen each day but the level of progestin changes between the first and second week of the 21-day cycle of hormonal pills. In triphasic pills, the estrogen and progestin type remains the same but the level may change with the progestin levels as the progestin has three different levels in the 21-day cycle with triphasic pills. The estrogens and progestins used are synthetic and different from their naturally occurring counterparts. (Varney, et al. 513-514) Pharmaceutical companies are now producing oral contraceptive pills with ninety-one-day cycles. Eighty-four hormonal pills and nine sugar pills allow for four "periods" per year and optional menstruation. (Rako, 119)

Progesterone-only pills are often called the mini pill and may or may not inhibit ovulation depending on the dose of progesterone. These pills work primarily by thickening the cervical mucus and secondarily, by effecting the endometrium and impairing implantation. (Bennett and Pope) In all cases, when a woman is on contraceptive pills, it produces a pharmacologic rather than a physiologic state with menstruation being a pseudomenstruation produced by the withdrawal of the pharmacologic drugs. This is better called withdrawal bleeding where the hormonal withdrawal causes the endometrium to break down and accounts for the shorter duration and scantier flow often noticed by women taking the combination oral contraceptive pills. The combined estrogen-progestin pill produces stromal edema, predeciduation and some degree of glandular involution. After a few cycles, the endometrium yields a thick, hypoplastic appearance. For this reason, women may experience cessation of menstrual flow. (Varney, et al. 513-514)

For any woman that chooses to take oral contraceptive pills, there are several risk factors that increase. In *The Breast Cancer Prevention Program*, Sam Epstein, MD, writes, "more than 20 well-controlled studies have demonstrated the clear risk of premenopausal breast cancer with the use of oral contraceptives. These estimates indicate that a young woman who uses oral

contraceptives has up to ten times the risk for developing breast cancer as does a non-user, particularly if she uses the Pill during her teens or early twenties; if she uses the Pill for two years or more; if she uses the Pill before her first full-term pregnancy; if she has a family history of breast cancer." This evidence makes us conclude that if a young woman takes oral contraceptives before she is 25 for two years and before she has had a full-term pregnancy, she increases her risk of breast cancer by ten-fold. (Singer, "Rethinking") According to a meta analysis study by the American Cancer Society and conducted by Isabelle Romieu, MD and her colleagues, "Data combined from case-control studies revealed a statistically significant positive trend in the risk of premenopausal breast cancer for women exposed to oral contraceptives for longer duration. This risk was predominant among women who used oral contraceptives for at least 4 years before their first term pregnancy." (Romieu, et al)

According to Joel Brind, PhD on the Dolle study from Fred Hutchinson Cancer Research Center in Seattle, WA (Dolle, et al), "The real dramatic new finding was a strong association between TNBC and OC (oral contraceptives) use; particularly among those whose first OC use was under age 18: odds ratio (OR) = 3.7, and those who had gone between 1 and 5 years since last use: OR = 4.2. (OR is a measure of relative risk. Hence, OR = 4.2 means a 320% risk increase over those who never used OCs). Importantly, this strong association with OC use did not appear for non-TNBC cancers, which were very weakly related (20% - 30% risk increase) to OC use. As noted in the literal bottom line of the Dolle study's abstract, such clear findings are strongly indicative of a genuine causal effect of OC's on TNBC, i.e., "lending support to a distinct etiology." While the authors did not suggest anything about the nature of this distinct etiology", it is likely that, rather than simply acting as a tumor promoter (secondary carcinogen), the synthetic estrogen-progestin combination of OCs, or one or more of their metabolites, actually act as primary carcinogens, i.e., cause mutations in breast cells that lead to cancer formation." (Brind)

The Journal of Clinical Endocrinology and Metabolism explains that oral contraceptives may not be as protective regarding endometrial cancer for women with PCOS either: "Another important consideration of long-term therapy in PCOS is the prevention of endometrial cancer. Chronic anovulation is associated with an increased risk for endometrial cancer, and there seems to be an increased prevalence of endometrial cancer among women with PCOS, including young women with the disorder. Notably, increased risk for endometrial cancer was also reported in women with increased serum levels of insulin and lower serum levels of SHBG, both prominent features of women with PCOS and of insulin resistance. Whether insulin resistance itself plays a role in the development of endometrial cancer is unknown, although studies by Nagamani *et al.* provide evidence supporting this possibility. Notably, there are no prospective studies of the incidence of endometrial cancer in PCOS.

Although OCPs in the general population have been associated with a significant reduction in endometrial cancer risk (~50% decrease; the frequency of induced cycles that prevents endometrial cancer specifically in women with PCOS is unknown. Standard practice to prevent endometrial cancer in women with PCOS is to induce a withdrawal bleed with a progestin on an every 1- to 3-month basis, but no studies justifying this practice in premenopausal women have been reported.

While studies with insulin-sensitizing drugs are limited, they suggest that administration of these drugs is associated with substantially increased frequency of ovulation, followed by menstrual bleeding, resulting in at least six ovulatory menses per year in 55–85% of treated women. Although no prospective study focusing on prevention of endometrial cancer in PCOS by insulin-sensitizing drug has been conducted, this frequency of ovulation would be consistent with the current standard of care for the prevention of endometrial cancer in women with PCOS.

Furthermore, the theoretical possibility exists that ovulation induced by an insulin-sensitizing drug might be more successful in reducing endometrial cancer risk than a withdrawal bleed induced by exogenous progestins, because only the former may be associated with a multitude of physiological ovulation-induced hormonal events (*e.g.* local changes in endometrial growth factors) that may attenuate endometrial cancer risk.” (Diamanti-Kandarakis, et al)

Studies have shown that women using low-dose oral contraceptives have a two-fold increased risk of fatal heart attack compared to non-users. (Spitzer, et al.) This risk is lower compared to older high-dosage oral contraceptive pills but is still significant. Similarly, the risk of a fatal brain hemorrhage is increased 1.4 times when comparing women using oral contraceptives to non-users. For women who smoke, there is a 12-fold increase in fatal heart attacks and a 3.1-fold increase in fatal brain hemorrhage. (Thorogood and Vessey)

According to a scientific article by Paul Weckenbrock, registered physician, and representative for the Couple to Couple League and the Global Catholic Network, “high Blood Pressure and alterations in the blood clotting mechanisms may be seen in women on the Pill. This may contribute to a 3-11 times increased risk of developing blood clots in Pill users compared to non-users. The risk is especially great for women who smoke and/or are over 35 years old.” Weckenbrock explains further that, “blood clots can form, restricting or blocking the flow of blood to critical organs and other body systems, possibly causing permanent damage. For example, a blood clot in the heart would cause a heart attack; in the brain it would cause a stroke or brain hemorrhage; a clot which moved from elsewhere in the body and lodged in the lung would cause a pulmonary embolism; in the kidneys a clot would cause a renal artery thrombosis and kidney damage; in the retinal arteries it would cause temporary or permanent blindness.” (Weckenbrock)

According to a special feature in the Journal of Clinical Endocrinology and Metabolism, “Women with PCOS are at high risk for the development of glucose intolerance and heart disease, likely related in part to their insulin resistance. OCPs have long been the mainstay for the treatment of the syndrome. However, as outlined below, some studies have shown that OCPs may themselves decrease insulin sensitivity and glucose tolerance, and these sequellae might possibly increase the risk for type 2 diabetes mellitus in women with PCOS.

For example, a review of the literature revealed only six short-term clinical trials that prospectively evaluated the metabolic effects of OCPs specifically in women with PCOS. Only one study included a placebo control group, two others compared the effects of an OCP to metformin, and all five studies assessed a limited number of women.

Two studies demonstrated significant deteriorations of insulin sensitivity, using either the hyperglycemic clamp or the hyperinsulinemic-euglycemic clamp, in women with PCOS when a low-

dose norethindrone-containing triphasic combination OCP or a high-dose OCP containing cyproterone acetate was administered for 3–6 months. The study by Korytkowski *et al.* also assessed a control group of normal women, in whom OCP administration was associated with an increase in serum triglycerides, a finding consistent with the induction of insulin resistance.

In the study by Dahlgren *et al.*, the decrease in insulin sensitivity occurred despite a stable body mass index and reduction in circulating androgens. Notably, when these investigators treated eight women with PCOS with a GnRH agonist for 6 months, serum androgen concentrations also declined markedly, yet insulin sensitivity improved. This suggests that the degree of insulin resistance induced by OCPs was both substantial and related directly to the pills themselves and not to suppression of ovarian function.

The remaining four studies assessed the effects of 6-month administration of a low-dose OCP on oral glucose tolerance in women with PCOS. One study administered a desogestrel-containing pill, and the other three studies used a pill containing cyproterone acetate that was administered to either obese or nonobese women with PCOS.

Two of these studies, both conducted in obese women with PCOS, demonstrated a deterioration of glucose tolerance with OCP administration, as evidenced by higher plasma glucose levels during the oral glucose tolerance test, with no change in plasma insulin concentrations. This occurred despite no change in body mass index and a marked decrease in circulating androgens. Because plasma insulin levels did not change, the deterioration in glucose tolerance was likely due to a decrease in insulin sensitivity.

The remaining two studies, performed in nonobese women with PCOS, showed no change in glucose tolerance or insulin sensitivity after the administration of an OCP containing cyproterone acetate, suggesting that the metabolic effects of OCPs may vary with body phenotype.

No cohort studies have been performed to assess the risk of developing type 2 diabetes specifically in women with PCOS who used OCPs. Nonetheless, two Nurses' Health Study cohort studies have assessed the risk of type 2 diabetes associated with the use of OCPs in a general population of healthy women. The first cohort of the Nurses' Health Study (NHS I) included healthy female nurses who were 30–55 yr old in 1976 and followed them for 12 yr. The mean age was 58 yr at follow-up, with a total of 2265 cases. The relative risk of developing type 2 diabetes associated with past use of OCPs was 10% greater than the risk in never users. It should be noted, however, that a large proportion of OCPs used in 1976 contained high-dose estrogens.

A second cohort of the Nurses' Health Study (NHS II) recruited healthy nurses who were 25–42 yr old in 1989 and followed them for 4 yr. Mean age at follow-up was only 38 yr, with a total of 170 cases. This study assessed the risk of developing type 2 diabetes associated specifically with use of low-dose OCPs. The adjusted relative risk was increased in past and current users of OCPs compared with never users (relative risk, 1.2 and 1.6, respectively). These differences did not attain statistical significance, which may have been related to the limitations of the study, including a brief period of observation, young age at follow-up, and a limited number of cases.

Whereas the above studies did not assess all available OCPs, an impossible task given the myriad of estrogen and progestin combinations, they nonetheless suggest that OCP use may decrease insulin sensitivity and/or impair glucose tolerance in some women with PCOS. Moreover, the observation that OCP use may be associated with an increased risk of type 2 diabetes in healthy women has even greater implications for women with PCOS. Women with PCOS represent a group characterized by baseline insulin resistance who are already at high risk for type 2 diabetes, and OCP use, therefore, might be expected to increase their relative risk for type 2 diabetes even more."

They conclude that, "OCPs are the traditional therapy for the chronic treatment of PCOS, and they are recognized to exert a number of beneficial effects. Their use cannot be dismissed lightly. Nonetheless, limited evidence raises the issue that OCPs may aggravate insulin resistance and exert other untoward metabolic actions that possibly enhance the long-term risk for diabetes and heart disease. This important clinical issue has received relatively scant attention from clinical investigators and remains unsettled. This report is as much a call for additional studies, critical and controlled, as for judicious caution." (Diamanti-Kandarakis, et al)

For women with human papillomavirus (HPV), the Lancet Oncology journal states that they, "could have a three-fold increased risk of developing cervical cancer if they have used oral contraceptives for more than 5 years, and up to a four-fold increased risk if they have used oral contraceptives for more than 10 years." ("HPV and")

Additional common side effects from oral contraceptives, with more information in the Physician's Desk Reference, include, "headaches, migraines, mental depression (even to the point of suicide and/or suicidal tendencies), a decrease or loss of sexual drive, abdominal cramps, bloating, weight gain or loss, and water retention; nausea and vomiting (in about 10% of users); symptoms of PMS, vaginitis and vaginal infections, changes in vision (temporary or permanent blindness, and an intolerance to contact lenses); gall bladder disease and either temporary or permanent infertility, when discontinuing the Pill, in users with previous menstrual irregularities or who began the drug before full maturity. Several of the symptoms, such as migraine headaches, contraindicate the use of the Pill because of life endangering complications." (Weckenbrock)

Several studies have shown that oral contraceptives influence the physiologic use and levels of some vitamins and minerals in the body. A 2003 study from Germany "showed significantly lower concentrations of cobalamin than controls." (Sutterlin, et al) A study from 1980 showed zinc and folic acid deficiencies in oral contraceptive users. (Thorp) Another study showed folic acid deficiency, especially a concern when women conceived quickly after going off the pill, and riboflavin and thiamin deficiency. (Prasad, et al) Results of a 1984 study showed reduced levels of, "riboflavin, pyridoxine, folacin, vitamin B12, ascorbic acid and zinc--and to increase the levels of four others--vitamin C, iron, copper and vitamin A." (Tyrer)

Like any pharmaceutical drug, oral contraceptives also affect gut flora and dysbiosis. Pharmaceutical drugs can kill good bacteria and stimulate the growth of bad bacteria which opens the body for infection and fungal overgrowth, like Candida. Gut dysbiosis is a potential, if not proven, cause for PCOS and damaging the gut flora further through routine prescription of oral contraceptives for PCOS is not evidence based. Damaged gut flora impairs vitamin and mineral

absorption, causes anemia, and affects future children because babies inherit their gut flora from their mothers. Abnormal or compromised gut flora in children is cause for all autoimmune diseases including allergies, ADD, ADHD, dyspraxia, and autism. (Campbell-McBride, Gut, 36) (“How the Pill”)

Many medical professional prescribe oral contraceptives to women of all ages for functional, benign cysts that are larger than the follicular cysts PCOS women commonly have. Studies have shown that simple observing and waiting for functional cysts to shrink in size is just as effective, if not more than, cyst aspiration or oral contraceptives. (Zanetta, et al) (MacKenna, et al) One study showed that functional ovarian cysts have a recurrence rate of 75%. (Duke, et al) The study concludes that, “Expectant management for up to six months does not cause risks for the patients and allows spontaneous resolution in over a third of cases, avoiding the costs and risks of unnecessary surgery.”(Zanetta, et al)

Because of the above research, clinical evidence has shown that oral contraceptives are not the best management for polycystic ovarian syndrome unless a woman wants to manage her cycles only and not heal the syndrome. Sadly, the above research also shows that the routine oral contraceptive use and routine prescription of oral contraceptives for PCOS women puts them more at risk for long-term complications which they are already at risk for contracting or will be after taking oral contraceptives for an extended time.

Clomid

Clomid or clomiphene citrate tablets USP, is an orally administered, nonsteroidal, ovulatory stimulant of considerable pharmacologic potency. With proper management and prescription, Clomid is used for anovulatory women, whether from polycystic ovary syndrome, amenorrhea-galactorrhea syndrome, psychogenic amenorrhea, post-oral-contraceptive amenorrhea, or secondary amenorrhea of undetermined etiology, desiring pregnancy.

“Clomiphene citrate is capable of interacting with estrogen-receptor-containing tissues, including the hypothalamus, pituitary, ovary, endometrium, vagina, and cervix. It may compete with estrogen for estrogen-receptor-binding sites and may delay replenishment of intracellular estrogen receptors. Clomiphene citrate initiates a series of endocrine events culminating in a preovulatory gonadotropin surge and subsequent follicular rupture. The first endocrine event in response to a course of clomiphene therapy is an increase in the release of pituitary gonadotropins. This initiates steroidogenesis and folliculogenesis, resulting in growth of the ovarian follicle and an increase in the circulating level of estradiol. Following ovulation, plasma progesterone and estradiol rise and fall as they would in a normal ovulatory cycle.

Available data suggest that both the estrogenic and antiestrogenic properties of clomiphene may participate in the initiation of ovulation. The two clomiphene isomers have been found to have mixed estrogenic and antiestrogenic effects, which may vary from one species to another. Some data suggest that zuclomiphene has greater estrogenic activity than enclomiphene.

Clomiphene citrate has no apparent progestational, androgenic, or antiandrogenic effects and does not appear to interfere with pituitary-adrenal or pituitary-thyroid function.

Although there is no evidence of a "carryover effect" of Clomid, spontaneous ovulatory menses have been noted in some patients after Clomid therapy.”

In a clinical trial of nearly eight thousand patients, 30% conceived successfully while on clomid. About 8% were multiple pregnancy, including twins, triplets, quadruplets, and quintuplets, with the great majority, about 7%, being twins. The survival rate from single births was 98% and 83% from multiple births. The overall incidence of fetal anomalies was less than 1% and was within the range of normal reported for the general population.

Clomid is contraindicated for patients with a known allergy to clomiphene citrate and any of its ingredients, including corn starch, lactose, magnesium stearate, pregelatinized cornstarch, and sucrose, and women who are already pregnant, those with liver disease, abnormal uterine bleeding, ovarian cysts (unless from polycystic ovarian syndrome), uncontrolled thyroid or adrenal dysfunction or the presence of an organic intracranial lesion such as a pituitary tumor.

Warnings given to those who choose to use clomid to increase fertility include visual disturbances which generally go away after cessation of use, and ovarian hyperstimulation syndrome (OHSS). "OHSS is a medical event distinct from uncomplicated ovarian enlargement. The clinical signs of this syndrome in severe cases can include gross ovarian enlargement, gastrointestinal symptoms, ascites, dyspnea, oliguria, and pleural effusion. In addition, the following symptoms have been reported in association with this syndrome: pericardial effusion, anasarca, hydrothorax, acute abdomen, hypotension, renal failure, pulmonary edema, intraperitoneal and ovarian hemorrhage, deep venous thrombosis, torsion of the ovary, and acute respiratory distress. The early warning signs of OHSS are abdominal pain and distention, nausea, vomiting, diarrhea, and weight gain. Elevated urinary steroid levels, varying degrees of electrolyte imbalance, hypovolemia, hemoconcentration, and hypoproteinemia may occur. Death due to hypovolemic shock, hemoconcentration, or thromboembolism has occurred. Due to fragility of enlarged ovaries in severe cases, abdominal and pelvic examination should be performed very cautiously. If conception results, rapid progression to the severe form of the syndrome may occur." The lowest dose of clomid that succeeds in ovulation should be used for this reason. General precautions that patients are informed of include visual symptoms, abdominal/pelvic pain or distention, multiple pregnancy and the potential risk factors that go with it, metabolism disorders including hyperlipidemia and hypertriglyceridemia,

Adverse effects, or side effects, indicated in clinical trials include ovarian enlargement, vasomotor flushes, abdominal-pelvic discomfort, distension and bloating, nausea and vomiting, breast discomfort, visual symptoms, blurred vision, lights, floaters, waves and unspecified visual complaints, photophobia, diplopia, scotomata, phosphenes, headache, abnormal uterine bleeding, intermenstrual spotting and menorrhagia. Adverse effects for less than 1% of patients in clinical trials include acute abdomen, appetite increase, constipation, dermatitis or rash, depression, diarrhea, dizziness, fatigue, hair loss/dry hair, increased urinary frequency/volume, insomnia, light-headedness, nervous tension, vaginal dryness, vertigo, and weight gain/loss. Adverse effects after clinical trials and postmarketing include fever, tinnitus, weakness, arrhythmia, chest pain, edema, hypertension, palpitation, phlebitis, pulmonary embolism, shortness of breath, tachycardia, thrombophlebitis, migraine headache, paresthesia, seizure, stroke, syncope, acne, dermatologic allergic reaction, erythema, erythema multiforme, erythema nodosum, hypertrichosis, pruritus, and urticaria. ("Clomid side")

1. Surgery

Ovarian drilling

Laparoscopic ovarian drilling or ovarian diathermy is a surgical treatment done through a small incision near the umbilicus under general anesthesia. The ovarian drilling procedure involves breaking through the thick outer layer of the ovaries characteristic of cystic ovaries and destroys ovarian tissue by laser fibre or electrosurgical needles puncturing the ovary for 5 seconds or so in 5 to 10 places. In order for the surgeon to insert the laparoscopic viewing and surgical instruments without damage to the internal organs, a tube with carbon dioxide gas is inserted to inflate the abdomen. A small camera attached to a telescope is also inserted to allow for surgical viewing. Surgical instruments may be inserted through the same incision or other small incisions may be cut in the pelvic area.

After losing weight and trying different medications, ovarian drilling is often suggested to achieve regular ovulation, menstruation, pregnancy, and to make ovaries more sensitive to medications with these same fertility goals. Generally, criteria for ovarian drilling must be met before it is suggested and is based on the AMH test, a test for male hormones, size of the ovary and female hormone imbalance like FSH and LH.

Destroying part of the ovaries through ovarian drilling has been shown to restore regular ovulation cycles with an 80% success rate. 50% of women who succeed in ovulating through ovarian drilling then conceive. Live birth rates after conception because of ovarian drilling are not available and thought to be less than 50%. Ovarian drilling with the goal of maintaining a pregnancy and producing a healthy infant then has a 20% chance or less of meeting this goal. Young women with a good body mass index are more likely to have positive results from ovarian drilling.

Risks of ovarian drilling are infection of the incision, bleeding from the incision, internal bleeding, accidental injury to internal organs or major blood vessels from the laparoscope or surgical instruments, pain after the procedure from inflating the abdomen with gas, problems caused by anesthesia, and adhesions or scarring inside the body which can form between the ovaries and fallopian tube making conception more difficult. Risk of death is rare. If there is too much damage to the ovaries, there is risk to run out of ova at a young age and go through menopause early. ("Ovarian") ("Laparoscopic") ("Patient") ("Ovarian" *Fertility*)

Cyst Aspiration

Cyst aspiration is a procedure to remove fluid from a cyst in the ovary and is favored when the cyst is assumed to not be cancerous and is a result of hormones instead. If the needle to remove the fluid from the cyst will be inserted into the cyst through the vagina, a vaginal ultrasound probe is placed inside the vagina to view the ovaries, uterus and other pelvic organs. The ultrasound probe is replaced with a speculum and local anesthetic is injected into the vagina where the needle is expected to be inserted. The speculum is switched out for the ultrasound probe again and a thin needle, which is about the same size as those used for taking blood samples, is passed through the vagina into the cyst for the fluid to be removed using guidance by the ultrasound. The fluid is drained into a syringe and can then be tested for cancer or other pathology. If the needle to remove fluid from the cyst will be inserted through the abdomen, a local anesthetic is used there and the procedure is continued the same way. ("Procedures") ("Ovarian cyst")

Cyst aspiration is suggested for functional ovarian cysts which are naturally occurring cysts from ovum maturing and then forming a follicular cyst. These cysts generally reach no more than 2.5 centimeters in diameter but occasionally they may reach 4 to 5 centimeters. (“How are”) In this case, torsion of the fallopian tubes, hemorrhage or rupture is more likely and cyst aspiration is suggested. (“Ovarian cyst”) Women with PCOS have cysts that are 2 to 8 millimeters in size.(“How are”)

Studies have shown that simple observing and waiting for functional cysts to shrink in size is just as effective, if not more than, cyst aspiration or oral contraceptives. (Zanetta, et al) (MacKenna, et al) One study showed that functional ovarian cysts have a recurrence rate of 75%. (Duke, et al) The study concludes that, “Expectant management for up to six months does not cause risks for the patients and allows spontaneous resolution in over a third of cases, avoiding the costs and risks of unnecessary surgery. Aspiration does not provide better results than simple observation.”(Zanetta, et al)

Cyst aspiration risks include infection, internal bleeding, and damage to the pelvic organs. (“Procedures”)

Cystectomy

A cystectomy is the term used for a procedure, usually laparoscopic, where a cyst is removed leaving the ovaries intact. Under general anesthesia, the surgery lasts for about one hour. Several small incisions are made in the abdomen for surgical tools and a small fiber optic camera to be threaded through. If the laparoscopic examination reveals that the cyst is too large, connected to a significant amount of ovarian tissue, or cancerous, the surgeon may find it necessary to remove the entire ovary. Recovery time from laparoscopic cystectomy is on average less than four weeks.

The removal of a cyst through cystectomy is the preferred procedure compared to oophorectomy and hysterectomy because the long term risks are less significant when the ovaries and uterus remain. A cystectomy is recommended when a cyst affects fertility, is bleeding, causes pain, remains after several cycles, grows larger over several cycles or shows signs of being malignant or cancerous. After cystectomy, it is possible for new cysts to form on the same ovary or opposite ovary. The only way to prevent cysts from forming is removing the ovaries through oophorectomy surgery.

Risks of cystectomy are re-occurring cysts after surgery, pain, scar tissue adhesions forming on the fallopian tubes or ovaries affecting fertility, infection, damage to the bladder or bowel from surgery, excessive bleeding, and problems with anesthesia. (“Surgery for”) (“Ovarian cystectomy”)

Oophorectomy

Oophorectomy, also called ovariectomy, is the surgical removal of an ovary or both ovaries. When both ovaries are removed, it is called bilateral oophorectomy, and when one ovary is removed it is called unilateral oophorectomy. If oophorectomy is combined with removing the nearby fallopian tubes (salpingectomy), the combination surgery is called salpingo-oophorectomy. (Mayo clinic staff, “Oophorectomy”)

During laparoscopic oophorectomy, general or regional anesthesia is given and a small incision is made below the navel in the abdominal wall. A laparoscope, a tube containing a light source and a tiny lens, and a small camera can then be inserted through the incision. The tiny camera allows the surgeon to view inside the abdominal cavity on a video monitor. Once the ovaries and fallopian tubes are detached, they are then cut into smaller pieces if necessary and removed through a small incision in the top of the vagina. The patient is generally able to leave the hospital within one day of laparoscopic oophorectomy and resume driving, exercising, etc. within one month. (“Salpingo-oophorectomy”)

If oophorectomy is not performed with a laparoscope, a 4-6 inch incision below the navel extending up from the pubic bone toward the navel or horizontally across the pubic hairline is necessary. The vertical incision gives the surgeon more viewing, but the horizontal incision leaves a less noticeable scar. Abdominal oophorectomy has more risk of bleeding and a longer hospital stay and recovery time. (“Salpingo-oophorectomy”)

Oophorectomy is performed for ovarian cysts, ovarian cancer, endometriosis (often in conjunction with hysterectomy), and as a precaution for those at high risk of developing ovarian or breast cancer. (“Oophorectomy”) (“Oophorectomy-topic”)

For those with PCOS, oophorectomy may be considered as a way to deal with symptoms like menstrual problems and hirsutism. Medical opinion states that removing reproductive organs does not eradicate the symptoms of PCOS or correct the metabolic imbalance and hormonal imbalance associated with PCOS. (“PCOS and Hysterectomy”) (Boss, Sterling and Legro, 67-68)

Benefits include a reduced risk of ovarian cancer and reduced problems from endometriosis. (Parker M.D.)(“Oophorectomy benefits”) Oophorectomy surgery itself is considered to be quite safe, but the longterm health risks are more disconcerting.

Risks from oophorectomy include increased risk for dementia or cognitive impairment by 46% and parkinsonism by 68% compared to women with their ovaries because of the neuroprotective effect of estrogen from the ovaries. (Osterweil) The younger the woman was, the more her risk increased of developing these diseases. (Shoupe, et al) Oophorectomy before menopause has increased risk of anxiety and depression also. (Parker M.D.)

Women who undergo oophorectomy before the age of 45 have an increased risk of arthritis and osteoporosis by 45% compared to 32% of women with their ovaries. Those women who had hormonal replacement therapy (HRT) after their oophorectomy fared better than women who did not have HRT. Women who did not have HRT were twice as likely to get arthritis and three times as likely to get osteoporosis compared to women with their ovaries. (“Ovary removal”) This increased risk is limited to when oophorectomy is performed before menopause. (Schuster, et al)

When the ovaries are removed, women are at a seven times higher risk of cardiovascular risk with the etiology not currently known.

Women report loss of sexual well-being after oophorectomy from lower libido, difficulty with sexual arousal, vaginal dryness, and sudden menopause which is often more difficult when induced by oophorectomy compared to naturally occurring menopause. HRT has not shown to improve these symptoms. (Parker M.D.)

The hormone production of the ovaries cannot currently be replicated by drug therapy because the ovaries produce hormones “a woman needs throughout her entire life, in the quantity they are needed, at the time they are needed, and released directly into the bloodstream in a continuous fashion, in response to and as part of the complex endocrine system.” (“Oophorectomy risks”)

Women younger than 45 who have their ovaries removed are at an 170% increased risk of mortality compared to women who retain their ovaries and still have the aforementioned risks from death by hip fracture, cardiovascular disease, and all cancers except for ovarian cancer. (Shuster, et al) (Parker M.D.)

Intrauterine Insemination (IUI)

Intrauterine insemination is a procedure used for treating infertility, often accompanied by pharmaceutical ovulatory stimulants, where by sperm that have been washed are placed directly into the uterus the day after ovulation. The full IUI process involves prescribing ovulatory stimulants and scheduling the IUI procedure to coincide with ovulation. A semen specimen is produced either at home or at the clinic through masturbation after 2-5 days of abstinence from ejaculation. The semen is processed and “washed” in the laboratory. This process separates and concentrates the sperm from the rest of the semen. Once the sperm is ready, the woman lays on an exam table in the supine position and a speculum is placed in the vagina. The cervix is gently cleaned and the washed specimen of highly motile sperm is placed either in the cervix (intracervical insemination, ICI) or higher in the uterine cavity (intrauterine insemination, IUI) using a sterile, flexible catheter. If done properly, artificial insemination feels similar to a PAP smear to the woman and takes only 15 to 20 minutes. After the procedure, it is advised that the woman stay in the supine position for about 20 minutes. (“Artificial insemination”) Some references report this does not affect success rates but a recent report indicated that success rates were 50% higher when the woman laid still in the supine position. (Gardner)

Generally, success rates are anywhere between 5-20% depending on age and the cause for infertility. General recommendations are trying IUI for 3-6 cycles, again depending on the cause for infertility. PCOS women can try IUI for longer than most because of the pathology of their infertility.

IUI is often used for unexplained infertility, mild endometriosis, problems with ovulation, mild male factor infertility and cervical factor infertility. IUI is not generally recommended if the woman is older, if egg or sperm quality is extremely poor, if there is severe endometriosis, or severe damage or blockage to fallopian tubes. Donor egg or sperm may be used in some of these cases or in vitro fertilization may have higher success rates in fewer cycles.

Risks from IUI are very low compared to other more invasive infertility treatments. “The woman could develop an infection in the uterus and tubes from bacterial contamination that originated either in the semen sample, or through a contamination of the sterile catheter in the vagina or cervical area during the procedure. Careful cleaning of the cervix and cautious technique make this a rarity.” Risks from ovulatory stimulants, like Clomid, used with IUI still remain and should be

considered

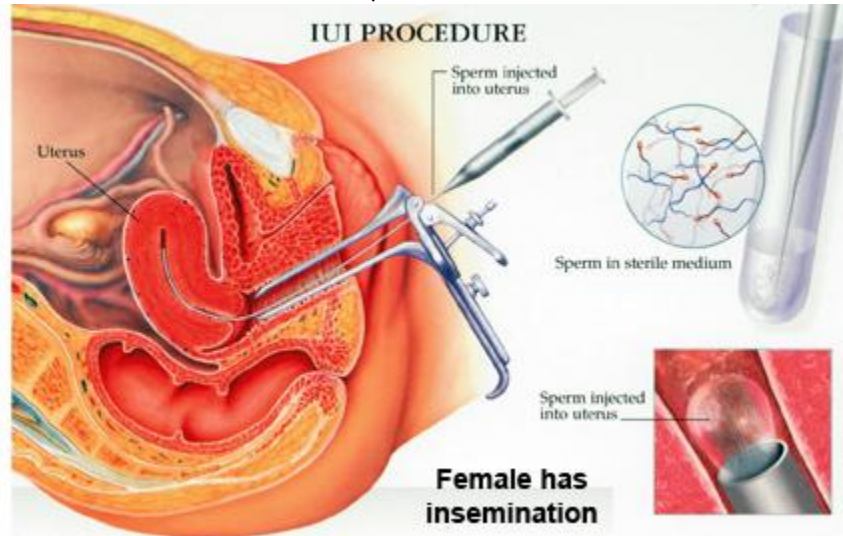


Male has a date with the cup

also.

(“Artificial

insemination”)



[pic credit](#)

In Vitro Fertilization

In Vitro fertilization is the process by which an ovum is fertilized and transferred into the uterus or the process of transferring ova and sperm into the fallopian tube in hopes of fertilization. The process of in vitro fertilization involves several steps. First, ovulation-inducing medications, like Clomid, are used to time ovulation and produce multiple ovum for a higher success rate of fertilization. Next, the ovum are removed under sedation, local anesthesia and the guidance of ultrasound imaging from the ovaries using a hollow needle. Sperm is collected, processed and prepared.

In the next step, there are variations on what may take place depending on the couple age and type of infertility. Commonly, through a process called *insemination*, the sperm and ovum are placed in incubators in a laboratory to enable fertilization. Intracytoplasmic sperm injection, where sperm is injected directly into the ovum, may be used if the probability of fertilization is low. Once fertilization is confirmed, the ovum are monitored for cell division and are now called embryos. Gamete intrafallopian transfer (GIFT) is similar to in vitro fertilization, with the main difference being that sperm and ovum are transferred directly into the fallopian tubes for fertilization, and fertilization does not take place in laboratory incubators. GIFT accounts for 2% of assisted reproductive technology.

In the case of IVF, the chosen number of embryos are transferred into the woman’s uterus from one to six days after the ovum were retrieved. It is most common for the ovum to be transferred after two to three days. The transfer process involves a speculum being placed in the vagina to expose the cervix, a catheter placed through the cervix into the uterus, the suspension of a predetermined number of embryos into fluid and then those embryos being placed through the catheter into the uterus. A variation of this is called zygote intrafallopian transfer (ZIFT) where the embryo(s) are transferred to the fallopian tubes through a laparoscopic surgical procedure instead of into the uterus. ZIFT accounts for 1.5% of assisted reproductive technology. (“In Vitro”)

For PCOS women, IVF is usually the last resort to conceive and carry a baby to term. For this reason alone, it carries many benefits for couples who desire a baby and are not opposed to IVF for ethical reasons. Success rates based on live birth rate per IVF cycle are guesstimated to be 30-35% for women under 35 years, 25% for women 35-37 years, 15-20% for women 38 to 40 years and 6-10% for women over age 40. ("In Vitro") Some clinics report live birth success rates of 60% per ova retrieval for women under 35. ("PCOS and IVF") As long as the ovaries can be stimulated to produce ovum, success rates for PCOS women are no different for other women attempting IVF and many IVF clinics report that diet and lifestyle changes alone are enough to help PCOS women achieve pregnancy, making IVF services unnecessary. ("IVF Questions")

Risks associated with IVF include the increased risks from ovarian stimulation drugs which have been previously discussed under the Clomid section and the increased risks from laparoscopy and receiving anesthesia. "Additionally, there is a slight risk of bleeding, infection, and damage to the bowel, bladder, or blood vessel. Less than one patient in 1,000 will require surgery to repair damage caused during the egg retrieval process. The chance of a multiples pregnancy is increased in all assisted reproductive procedures. There are additional risks and concerns related to multiples during pregnancy including the increased risk of premature delivery." ("In Vitro") About 5% of IVF pregnancies are ectopic and cannot be carried to term. (Jeffries) Because ectopic pregnancies do not end in a live birth, they are not included in IVF success statistics and are an additional 5% conception rate to the live birth success rate.

In a recent study on early and late obstetric outcomes for women who achieved pregnancy through IVF and had PCOS, it was found that, " There is conflicting evidence on the association between polycystic ovary syndrome (PCOS) and early and late pregnancy complications. It is unclear if the reported risks are independent of maternal weight and medical conditions such as preexisting hypertension and diabetes. We performed a study to examine the risk of early and late pregnancy complications after in vitro fertilization in a large group of women with PCOS (n=130) compared to controls (n=130). The miscarriage rate was similar in PCOS women and controls. PCOS was not associated with miscarriage independent of age and BMI. The prevalence of gestational DM (GDM) was also similar in both groups (12% PCOS versus 11% controls). PCOS was not associated with GDM, however, maternal weight was significantly associated with GDM. Risk of both pre-eclampsia and pregnancy induced hypertension was 10% in PCOS and 5% in controls, but not statistically significant. Women with preexisting hypertension had a higher risk of developing preeclampsia. There was no significant difference in preterm delivery, cesarean section, twin gestation, intrauterine fetal death and intrauterine growth restriction in the 2 groups. Our study shows that obesity was a significant contributor to pregnancy complications such as gestational diabetes. These findings may warrant aggressive counseling of women with PCOS on the potential benefits of weight loss prior to pregnancy." In conclusion, obesity is the factor predisposing women to obstetric complications whether they had PCOS or not, and women should be counseled on eating habits to prevent obstetric complications. (Bagegni, et al)

Because of the increased insulin production associated with PCOS and consequently, the elevated male hormone production such as testosterone, PCOS women are more likely to struggle with the ova development required for conception. These factors can also increase blood-clotting factors which may interfere with blood supply necessary for the developing follicle and uterine lining. For this reason, the protocol of IVF clinics are likely to involve the prescription of Metformin

to increase the odds of conception and a live birth through the management of insulin production. (“PCOS and IVF Complications”)

IX. Alternatives to Allopathic Medicine

Stress Reduction

The ability for stress to affect the body in such a way that hormonal dysregulation, cortisol and blood sugar regulation and adrenal function are all affected, is well established. One animal study showed that increased sympathetic nervous system activity from stress preceded the induction of polycystic ovaries and played a role in the maintenance of ovarian cysts. Stress management strategies are an important part of the holistic treatment of women with PCOS. (Romm, 178, 185)

Weight loss

It has been proven for decades that obesity is linked to hormonal imbalance in women, specifically abnormal ovulation, menstrual irregularities and excess hair growth.(Hartz, et al) In 2003, a study indicated, “that obesity is the important factor determining the insulin sensitivity and hyperinsulinemia in PCOS women. Moreover, the body weight is the major determinant of insulinemia, insulin sensitivity and ovarian hyperandrogenism, independently of PCOS.” (Dravecka, et al) Because of these findings, weight loss is considered to be an effective step in treating PCOS. A study on PCOS women who underwent gastric bypass surgery showed that weight loss made a significant improvement in the clinical manifestations of PCOS including hirsutism, menstrual irregularities and infertility. (Eid, et al) Besides being a trigger for the current clinical manifestations of PCOS, obesity also has shown to be the trigger for long term consequences of PCOS including hyperinsulinemia, hypertension and cardiovascular disease with menstrual irregularities and the age and size of the follicle cohort, ovarian cysts, not having the same impact. (Sukalich and Guzik) (Elting, et al)

The key to meeting the goal of weight loss is successful long term weight reduction and then maintenance. Dietary modification that is a lifestyle change, meaning long term and practical to continue, with exercise, is the safest way to lose weight. Drastic weight loss from extreme dieting worsens PCOS symptoms and if it cannot be maintained, it often results in gaining the weight back plus some. (Norman, et al) (Richardson)

B. **Diet**

Hippocrates said, “Let food be thy medicine and medicine be thy food.” He also said, “He who does not know food, how can he understand the diseases of man?” The food that PCOS women consume every day has a large impact on their health. It may also be the cause of PCOS. Soy, saturated fats, cholesterol, animal products, sugar, GMOs and processed foods have all been recommended at some point for their health benefits and at other times, have been labeled as poison. This is a look at the history of food which leads us to what we eat now, the illness epidemic present with us all today and what the research says is best for women with polycystic ovarian syndrome to eat.

Soy

In ancient China, the soybean was revered as one of the “Five Sacred Grains” but interestingly, they did not eat it nor is it a grain. The Chinese written characters for rice, barley, wheat and millet show the grains are eaten but the character for the soybean shows the roots. This is because the Chinese grew soybeans as a “green manure” by using it as a cover crop between plantings of food crops. When plowed under, it enriched the soil because soy lives symbiotically with *Rhizobium*, a kind of bacteria that forms nodules on the roots of plants in order to capture nitrogen from the air and fix it in the soil. (Daniel, 9) There is no evidence that the ancient Chinese ate soybeans; in fact, they considered soybeans inedible. Until around 200 B.C. when the Chinese applied the process of making *chiang* to soybeans, (Daniel, 24) a preparation method using fermentation that makes soybeans digestible, the antinutrient known as trypsin inhibitor made soybeans indigestible and caused digestive distress, bloating and gas.

Chiang can best be described as a soupier version of the soybean paste that the Japanese call miso. Originally, *chiang* was food that was salted and then immersed in a mixture of salt and wine until the food broke down. The fermentation deepened the flavor and made a living food probiotic full of enzymes. Most often used to preserve protein-rich animal foods like fish, shellfish, game and meat, it often included blood, bones and guts. Once applied to soybeans somewhere between 200 BC and 400 AD, soy sauce appeared around the same time since it was originally the liquid poured off from the production of *chiang*. Miso arrived in Japan with the arrival of Chinese missionary priests sometime between 540 and 552 AD, although it was not popularized by the samurai warriors until the 12th century AD. Natto entered the Asian people’s food supply around 1000 AD and tempeh no earlier than 1600 AD. Tofu was invented and became popular around the same time as miso since it was a low-cost protein to the vegetarian monastic diet and became a staple in Buddhist monasteries. (Daniel, 10-11) Consumption of tofu was widespread as a condiment, in small amounts usually in fish broth, through China, Korea and Southeast Asia by 700 AD and accepted as a meat substitute when other sources were unaffordable or unavailable.

Currently, the average consumption per year of soybeans in China, Indonesia, Korea, Japan and Taiwan is 3.4, 6.3, 10.9 and 13 kilograms. That equals 9.3 to 36 grams per day. Japan is estimated at 18 grams per day by the Organisation for Economic Co-operation and Development. The China-Cornell-Oxford study in which the dietary habits of 6,500 adults in 130 rural villages was surveyed, showed that on average, legume consumption was 12 grams per day with only one-third being soy. The U.S. government’s daily recommended allowance for soy is 25 grams, much higher than the averages Asians consume. Additionally, the types of whole-food soy consumed in Asia are quite different when compared to the soy foods consumed at American tables. Traditional whole food soy products like miso, tofu and tempeh are now being exchanged for processed, American soy products. (Daniel, 27-28)

Soy milk, not traditionally valued by Asians, was nothing more than a step in the tofu-making process. Not popularized till the 20th century, the old-fashioned process involves soaking the beans, grinding the softened beans on a stone grinder, putting the now bean mush into a cloth bag, and then pressing it until the liquid runs out. Filthy scum that rises to the surface is carefully removed. Today, the method of making soy milk is faster and cheaper, resulting in a different product. The soaking phase is quicker by using an alkaline solution instead of water. The paste that forms is cooked in a pressure cooker and any scum that forms is not skimmed off. The high pH of

the soaking solution along with pressure cooking destroys nutrients including vitamins and amino acids and can produce a toxin called lysinoalanine, which even in low levels, has safety concerns. To produce the flavored, cartoned products next to the dairy products in the refrigerated section today, the enzyme lipooxygenase responsible for the “beany” and rancid flavor must be covered by barley malt, brown rice syrup, raw cane crystals, or some other form of sugar. Plain soy milk also has sugar added. The sour, bitter, and astringent aftertaste comes from oxidized phospholipids (rancid lecithin), oxidized fatty acids (rancid soy oil), the antinutrients saponin and the soy estrogen called isoflavones. In order to make up for vitamins lost in the process and compete with real milk, soy milk is also fortified with calcium, vitamin D, and other vitamins and minerals and then stabilized with emulsifiers. Synthetic vitamin D2 is used by the soy milk industry even though it has been linked to hyperactivity, coronary heart disease and allergic reactions. (Fallon, 39) In the past, titanium oxide, a form of white paint was added to improve color and texture. Now, canola oil, ironically not soy oil, is added to provide creaminess. (Daniel, 64-69)

Soy products derived from soy milk are now on the market, including soy puddings, ice creams, yogurts, cottage cheese and whipped creams. *Time* magazine reported that, “The soy-based yogurts we tried were chalky, gritty and sour, with a chemical aftertaste. You might go for them, but a typical reaction from one of our testers was ‘awful.’” Most of these products contain a thickener from red seaweed called carrageenan as a fat substitute which has been shown to cause ulcerations and malignancies in the gastrointestinal tract of animals. (Daniel, 69) Soy cheese contains dangerous partially hydrogenated fats like soybean oil and trans fats. (pg 70) Soy ice cream’s first three ingredients are usually water, white sugar and corn oil followed by soy protein isolate, sometimes tofu, and more sugar. (Daniel, 71) Tofu is often nicknamed “soy cheese” but that is a misnomer, as tofu does not go through aging or fermentation. Tofu is made by adding a curdling agent to soy milk, plaster of paris or epsom salt, which separates the soy milk into curds and whey. The curds are then pressed and formed into cakes and sold as tofu. (Daniel, 72-74)

Soy flour is made from soybeans that have been hulled, cracked, heated and ground. Most of the time it is defatted since the soy oil causes the flour to go rancid so easily, not to mention the soy oil has huge profits. Soy flour is widely used in baked goods, billed as a protein booster or cholesterol reducer, as it is cheap, lengthens freshness and can be used as an egg or milk substitute. (Daniel, 79-84) Soy lecithin and margarine, food waste products packaged and made palatable through high tech manufacturing, have a history and consequences of their own. (Daniel, 97-119)

The invention and production of processed foods like Soysage, Not Dogs, Fakin’ Bacon, Sham Ham, Soyloin, Veat, Wham, Tuno, Bolono, Foney Baloney, Ice Bean, Hip Whip, and Tofurella have put soy foods in the upscale health food arena. Contributed to the world by the ingenuity of food scientists, soy has reached new heights with the addition of sugar, artificial sweeteners, salt, artificial flavorings, colorings, preservatives and MSG. (Daniel, 85-86) Technology and industrialization manufactures these foods using high heat and pressure, chemical solvents, acids, alkalis, and other harsh tools which contribute to their toxic and carcinogenic effects.

Soy has been popularized by claims that several servings per day lead to the highest levels of human health based on the elder population of Okinawa, the work of John Robbins and his research on the Okinawa people and the soy industry themselves. Robbins claims that the Okinawans have pristine health with long life because of the two servings of soy they consume per day, amounting to 12 percent of their calories. In his books, however, it is not clear how much the

soy the Okinawans actually eat. Some places say 60 to 120 grams of soy protein, but another table lists legume consumption of about 75 grams per day and another an average of three ounces of soy products per day, and another pie chart shows the 12 percent figure represents flavonoid-rich foods, not just soy. Robbins/ books also recommend consuming canola oil as the fatty acids in the diet, but canola oil is a genetically modified version of rapeseed oil that was not a staple in anyone's diet before the 1980s. A closer look at the cooking fat used in Okinawa shows that monounsaturated fat lard is actually the most common and that healthy and vigorous Okinawans consume 100 grams each of pork and fish every day. (Daniel, 15-16)

For women with PCOS, there are some concerns with consuming soy. Toxicity, one of the potential causes of PCOS, is a little known side effect with soy. Soy foods are high in fluoride content because soybeans pull fluoride from the soil and fertilizers, like most plants. Hydrogen fluoride gas, a pesticide, can also be taken in by the beans. It has also been reported that soybean plants are wonderful at taking industrial fluorides in the air and converting them into toxic organic forms. With any food item that is not organic, contamination from toxins is a concern for PCOS women. Soy foods are high in toxins in general because of the food processing factories where tap water is used. Tap water is used in soy milk, soy ice cream, and most parents reconstitute soy formula with tap water. To make the issue even more pertinent, fluoride synergizes and potentiates the actions of other toxins including lead, mercury, aluminum, manganese and other neurotoxins. (Daniel, 259-264) Aluminum toxicity is a concern with soy products because the more high-tech, industrial processes used, the more aluminum appears in the final soy product. (Daniel, 266)

Because soy is the leading plant phytoestrogen, soy in large amounts can have a big impact on the hormone system. Phytoestrogens are similar enough structurally to act like hormones and bind with estrogen-receptor sites throughout the body. (Daniel, 295) While there are more than 300 plants with estrogenic activity, including clover, only one commonly appears in our food supply - soy. Fertility problems from phytoestrogen exposure has been reported in birds, cows, mice, cats, dogs and sheep as well as humans. In sheep, the phytoestrogens in clover caused endometrial damage and cervical mucus changes associated with the inability to conceive. In cheetahs, the soy protein feed consumed in captivity disrupted the hormonal activity along the hypothalamic-pituitary-gonadal axis, and damaged the endometrium, making implantation difficult, just like with sheep. In studies on women of childbearing age, menstrual cycles lengthened, mid-cycle levels of luteinizing hormone reduced and follicle stimulating hormone reduced by 53%, and the effects of the soy isoflavones or protein continued for three months after ceasing soy consumption. With PCOS, swollen ovaries is a condition similar to goiter when the thyroid swells, leading to hypothyroidism and hormone imbalance. (Cowan) Soy foods have been shown to be a large factor and precursor to goiter, hypothyroidism, and related hormone imbalance. (Daniel, 311-330) It has been proven that soy consumption not in step with traditional soy preparation and consumption, can adversely affect fertility. Childbearing women with PCOS should know the side effects of excessive phytoestrogens on their bodies and on their babies in utero. (Daniel, 357-377)

Saturated Fat and Cholesterol

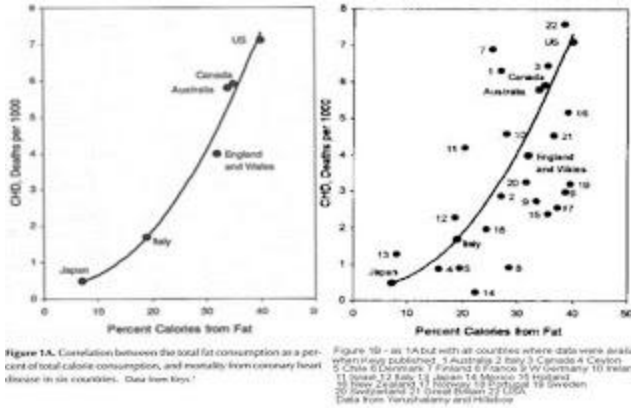
All diets recommended for women with polycystic ovary syndrome recommend avoiding all foods that lead to heart disease, specifically saturated fat and cholesterol. This includes things like butter, coconut oil, beef, milk, cheese, and eggs. Basically, any animal products should be avoided and vegetable oils, fruits and vegetables, and nuts and seeds for protein should be the most

preferred diet to prevent heart disease and fight insulin resistance. Considering the latest research in the last fifty years and subsequent recommendations by the medical community, this seems like the best logical advice. But, for this advice to also be true, the diet-heart hypothesis must hold up under scrutiny. Let us consider the history and research of the diet-heart hypothesis.

The concern about heart disease began in the years after World War II when the number of deaths from coronary heart disease began to rise. The reaction to this would be epidemiological studies and then clinical trials to measure the effects of intervention. The first government-sponsored epidemiological study was in 1948 where the researchers recruited two-thirds of the adult population in Framingham, Massachusetts, 6,000 people total, to observe them and then record statistical data on the factors that cause heart disease. The study showed that the group with high levels of blood cholesterol had slightly more heart attacks than those in the group with low levels of blood cholesterol, thus indicating that high levels of blood was indeed a risk factor for coronary heart disease.

But, risk factors are not necessarily a *cause*. Telephone usage also increased with the increase of heart disease following World War II, making telephone usage a risk factor for heart disease but not necessarily a cause. With this in mind, while heart disease increases and mortality from heart disease *increases* 10 times between 1930 and 1960 and consumption from animal fat *decreases* in the United States, this alone tells us that scientists must rule out butter, or animal fats, saturated fat and cholesterol as a risk factor for heart disease. (Campbell-McBride, Put 11) (Schmid, 179) (Fallon, 5) Ironically, 40 years after the study, the director said, "In Framingham, Mass., the more saturated fat one ate, the more cholesterol one ate, the more calories one ate, the lower the person's serum cholesterol. We found that the people who ate the most cholesterol, ate the most saturated fat, ate the most calories, weighed the least, and were the most physically active." It should also be said that those who weighed more and had abnormally high blood cholesterol levels were slightly more at risk but weight gain and cholesterol levels had an inverse correlation with fat and cholesterol intake in the diet. In other words, the more saturated fat and cholesterol they ate, the more weight they lost, and the thin people ate the most saturated fat and cholesterol. (Fallon, 5)

The key to taking the diet-heart hypothesis from the Framingham study to the dietary guidelines of the National Cholesterol Education Program was the work of Dr. Ancel Keys in 1953. He was the director of the Laboratory of Physiological Hygiene at the University of Minnesota and published several articles and appeared on television with the message that animal fat consumption is linked to heart disease. His Six Countries Study (see figure) showed the correlation between fat consumption and mortality from coronary heart disease in six countries which he carefully selected out of the 22 countries for which the data was available. His diagram showed a perfect correlation: the more animal fat consumed, the more deaths from heart disease. But, when you add back in all the other countries, there is no correlation between fat consumption and mortality from heart disease. (Campbell-McBride, Put 5) (Schmid, 180) (Shanahan, 168) Keys did not use animal fats in the experiments in his own lab either. His subjects were fed margarine which has 48% trans fat and saturated fat, and he simply equated saturated fat with animal fat in his message. To conclude that animal fat causes heart disease in a study where hydrogenated vegetable oil was used, is preposterous. (Shanahan, 169)



Unfortunately, our country's margarine producers took a hold of Key's work with Key as the perfect spokesperson. Keys appeared on TV relaying the statistics of his 1953 six countries study to the trusting lay public. The American Heart Association which relies on funding from the vegetable oil industry, also jumped on the bandwagon with Keys. One decade later, grocery stores had ample supply of convenience foods laden with vegetable oils and the public was convinced that the products made in factories was safer, healthier, and better than traditional fats. (Shanahan, 168-169) (Campbell-McBride, Put 6)

Often, animal studies are cited as proof that cholesterol causes heart disease, and thousands of scientists have carried out cholesterol experimentation on laboratory animals, but no other mammal utilizes cholesterol quite the same way humans do. Vegetarian animals, for example, do not normally eat foods containing cholesterol, and when force-fed foods with cholesterol, the level of cholesterol in their blood skyrockets. Rabbits are the animals most commonly used in experiments, but when fed cholesterol-rich foods, the level of blood cholesterol rises 10-20 times higher than ever seen in humans, and the cholesterol deposits that form do not resemble the arteriosclerosis lesions found in humans. The correlation that these studies make, high blood cholesterol and cholesterol deposits in rabbits and therefore, high blood cholesterol in humans causes heart disease, is not logical. (Schmid, 191-192)

In the 1987 *American Journal of Cardiology*, the Framingham study authors stated that, "the most important overall finding is the emergence of the total cholesterol concentration as a risk for CHD in the elderly" but made no mention of the several studies showing that high cholesterol levels in the elderly are unrelated to heart disease and may be protective. A study in Sydney, Australia found that cholesterol levels had no predictive value regarding heart disease in men over the age of seventy-four. A study in New York produced similar findings and yet the authors concluded that, "The findings of this study suggest that an unfavorable lipoprotein profile increases the risk for cardiovascular morbidity and mortality." Apparently, the conclusions of medical articles often have no apparent connection with the data presented in the body of the paper? A study from Yale University studied nearly one thousand elderly men and women over a four year period and concluded that twice as many of the participants with low cholesterol had heart attacks as those with the highest cholesterol levels. (Schmid, 188) A study in the *American Journal of Clinical Nutrition* from 2004 showed that, "a higher saturated fat intake is associated with less progression of coronary artery disease according to quantitative angiography." (Knopp and Retzlaff) A meta-analysis from the same journal concluded that, "there is no significant evidence for concluding that

dietary saturated fat is associated with an increased risk of CHD or CVD. More data are needed to elucidate whether CVD risks are likely to be influenced by the specific nutrients used to replace saturated fat.” (Siri-Tarino, et al) A February 2012 study from the Norwegian University of Science and Technology included over 50,000 people and concluded that women with high cholesterol have an inverse association with mortality from cardiovascular disease and stroke and that “clinical and public health recommendations regarding the 'dangers' of cholesterol should be revised.” (Petursson, et al) (Colpo) The list of studies proving that cholesterol and saturated fat do not cause heart disease is long and will not be included, as that is not the primary focus of this research paper.

Fortunately, physicians and scientists have been questioning the hypothesis that cholesterol and fat lead to heart disease. The Harvard School of Public Health even said, “the low-fat campaign has been based on little scientific evidence and may have caused unintended health consequences.” They also say that the low-fat, anti-cholesterol message may not only be wrong but may also be making epidemics like obesity and diabetes worse. (Shanahan, 166) So, why are saturated fat and cholesterol, potentially, so important?

The human brain is about 60% fat; every membrane of every cell, every organelle inside of cells, many hormones, neurotransmitters and other active substances in the body are made of fats. For this reason, we know that fats are extremely important in the diet and vital to life. The question is, what kind of fats? (Campbell-Mcbride, Gut 256) Cholesterol is a part of the structure of every membrane of every cell of every organ in our bodies. Almost half of many cell walls in the body are devised of cholesterol. Depending on the kind of cell and it’s function and purpose determines how much cholesterol is part of its make up. The human brain is very rich in cholesterol with about 25% of all body cholesterol being taken by the brain. Not surprisingly, every cell and structure in the brain and nervous system need cholesterol to maintain all function and function optimally. After the brain, the organs most needy for cholesterol are the endocrine glands, adrenals and sex glands, which produce the steroid hormones made from cholesterol like testosterone, progesterone, estrone, estradiol, corticosterone, so vital for all women, and optimal function so vital for women with PCOS. Additionally, cholesterol is vital for immune system function, as immune cells rely on cholesterol to fight infections and repair themselves after fighting. Those with high levels of cholesterol have shown to be protected from infections like AIDS, the common cold and others, while those with low cholesterol do not fare as well.

Birth defects occur in fetuses and infants deprived of adequate cholesterol in the womb. Breast milk contains a large amount of cholesterol and a specific enzyme for the baby’s digestive tract to absorb nearly 100% of that cholesterol. Children deprived of cholesterol in infancy have poor eyesight and brain function.

Myelin is a fatty substance in the nervous system and brain which coats every nerve cell. Its function is insulation but also nourishment and protection for every structure in the brain and nervous system. Those who start losing myelin develop multiple sclerosis and again, 20% of myelin is cholesterol.

Our cognitive abilities are also dependent on cholesterol because synapse function, our brain cells establishing connection with each other and required for memory, mental ability and intelligence, has been discovered to be run by cholesterol. Memory loss is one of the side effects of cholesterol lowering drugs and physiologically, makes sense with the knowledge of the importance

of cholesterol. NASA scientist and astronaut, Dr. Duane Graveline, MD, suffered memory loss while taking cholesterol lowering drugs, saved his memory loss by eating lots of cholesterol-rich foods and has gone on to describe his experience in his book *Lipitor- Thief of Memory, Statin Drugs and the Misguided War on Cholesterol*. (Campbell-McBride, 260-265)

In the Philippines, as with many of the Pacific islands, the traditional diet consisted of rice, coconuts, coconut oil, vegetables, root crops, herbs, some meat raised locally on green vegetation, and fish. Coconut oil, high in saturated fat, was consumed daily. In the early 20th century, often, one government doctor would serve a large community of some 50,000 people. People would visit the doctor to treat wounds, or tropical disease like malaria, diarrhea and dengue, a sickness spread from mosquitoes. Present western ailments such as diabetes, cancer, heart disease and thyroid problems were rare and people lived into their 80s and 90s with good health. In the 1970s when the demand for coconut oil fell due to the spread of the diet-heart hypothesis, most of the coconut farmers could no longer afford to support their families on their coconut farms. This necessitated a move to the city for employment and the adoption of the industrialized, western diet and consequently, the result of western ailments and diseases. (Shilhavy, 9-12) If saturated fat is bad for us, as the diet-heart hypothesis states, why did the Filipino people develop heart disease on the western diet and not when they were eating their traditional diet, saturated in saturated fat?

As recently as the 1970s, some one hundred thousand of the Maasai of East Africa still followed their traditional ways in an area of about ten thousand square miles in southern Kenya and northern Tanzania. The Maasai are nomadic cattle herders who still live under primitive conditions in some rural areas centered around their goats, sheep, and zebu cattle. Milk is the staple food, often fermented. Adult men typically consume one gallon of milk per day, providing one-half pound of butter fat, basically two sticks of butter per day. When the milk supply dwindles in the dry season, they consume fresh cow's blood taken from a wound made in the neck of a cow and then allowed to heal. Each animal is bled about once a month. On occasion, they eat large amounts of meat, usually from goats or sheep but rarely from cattle. There is no plant food in the traditional Maasai diet. The milk they consume has more total fat and cholesterol than standard milk in the United States and yet, they have low blood cholesterol and are free of cardiovascular disease and other chronic diseases. The Barabaig tribe and the Kalenjin tribe, also in Kenya, eat the same diet with meat only when an animal dies or as ritually sacrificed, and have the same good health history. If a diet rich in saturated fat and cholesterol caused heart disease, these people would die of heart disease at least as often as Americans do. (Schmid, 121-129, 184)

The Mediterranean diet, first promoted by a Dr. Ancel Keys, is often looked to as an example of a traditional diet low in saturated fat, cholesterol and animal products. With heart disease rare in the traditional diet, the people of Italy, Greece, Spain, Portugal and France have been looked to, along with their traditional diet, as a light on the hill for the rest of the developed world in heart disease prevention. The diet promoted is one of vegetables, fruit, bread, pasta, olive oil, and the occasional cheese or wine but very little animal food or saturated fat otherwise. The French always say *modération en toute chose* or moderation in all things. Why not occasional or moderate consumption of animal products in exchange for bread and pasta? Interestingly, it is easily discovered that the Mediterranean region of people consumed eggs, meat, fish, sausage, butter cream, full-fat-cheese, rich pates, and lard on a daily basis. Statistically, consumption of saturated fat increased by 45% between 1960 and 1990, while deaths from coronary heart disease decreased over the same period by 20%. (Schmid, 184-185)

So, now the question, then what really causes heart disease? Also called coronary heart disease, heart disease manifests itself through atherosclerosis which is a disease of the arterial wall when the artery deforms and develops raised patches called atherosclerotic plaques. Atherosclerosis in arteries impairs the blood flow to organs, whether to the brain causing a stroke or to the heart leading to *angina pectoris* (chest pain) and *myocardial infarction* (heart attack), what we consider to be heart disease. Most people believe the mistaken assumption that the atherosclerotic plaque is composed of fat and cholesterol. In reality, atherosclerotic plaques are composed of 68% fibrous tissue, mainly collagen, 8% calcium, 7% inflammatory cells, 1% foam cells, and 16% lipid-rich necrotic core which is mostly unsaturated. The plaque is like an ulcer, an erosion on the wall of the artery, which is covered by a mixture of the calcium, fibrin foam cells, clerotic tissue and chemically damaged fats. (Campbell-McBride, Put)

Science has proven through accumulated research that atherosclerotic plaque is a product of inflammation from the body trying to deal with an injury inside of our blood vessels. (Mullenix, et al) The vascular system is like the transport highway in our bodies as it carries hormones, nutrients, glucose, insulin, etc. but also any outside agents that may be damaging like microbes, parasites, free radicals, various toxic substances, drugs, and trans fatty acids. As these damaging agents find their way into the bloodstream and move in the vascular system, they attack whatever is closest which happens to be the cellular endothelial lining of the blood vessels. In a healthy body, inflammation occurs whenever something is injured, including the endothelial lining of blood vessels. Injured cells release a group of chemicals including histamine, prostaglandins, leukotrienes, complement, and kinins which send a message to the white blood cells to come destroy the damaging substance by swallowing it. These chemicals also wall off the damaged area with production of various proteins so that the damage does not spread. Once the injury is cleaned up, this process concludes and inflammation slowly recedes to start the process of repair. The repair process involves collagen tissue, made out of mostly cholesterol and collagen, growing through the damaged tissue to repair the blood vessel. The blood vessel then has a bright red scar which eventually fades to white in color when the repair finishes by the collagen accumulating and constricting the newly formed blood vessel.

With atherosclerosis, all does not go according to this beautiful team plan. Inflammation is continuous and this chronic issue competes with the process of repair in such a way that repair can never occur completely, and the ongoing inflammation destroys any newly formed repair tissue in the arterial wall.

Atherosclerotic plaque forms in three stages. First, the damage is done and the white blood cells arrive. The macrophage white blood cells swallow the damaging agent and debris of the damaged tissue and swell to a large size. These white blood cells are now called foam cells and inflammation is at its peak. In stage two, inflammation continues while the the repair process begins and collagen ends up growing through and around the white blood cell healing to form plaque. As inflammation persists, plaque accumulates with a crumbly, fatty core made out of dead white blood cells, debris of tissue, toxins and oxidised, chemically changed fats and cholesterol. In stage three, the plaque ruptures as the collagen weakens from the ongoing inflammation, the blood coagulates causing thrombosis and the artery gets blocked causing a heart attack or stroke.

Because the inflammation and repair process requires large amounts of cholesterol and that cholesterol inevitably gets slaughtered in the atherosclerotic plaque formation process,

atherosclerosis is usually blamed on the cholesterol present in the plaque when in reality, the body needs copious amounts of cholesterol to continue the healing process of combating atherosclerosis. Without it, healing cannot happen, nor can we fight infections and build *any* new cells. (Schmid, 175-200) (Campbell-McBride, Put)

In conclusion, regarding saturated fat and cholesterol, I think it is extremely important that PCOS women consume them without fear of heart disease. They have been shown to help with weight loss, which is beneficial for the majority of PCOS women. Healthy fats have been discovered to control diabetes and blood sugar and therefore insulin resistance, which, being the underlying pathology of PCOS, makes them worth their weight in gold. (Shilhavy, 51-58) Because of these benefits alone, it is not logical that saturated fats and cholesterol would also cause heart disease when these benefits, weight loss and blood sugar regulation, help to prevent heart disease. Lastly, with their avoidance based on the faulty claim of their role in heart disease, the fact that cholesterol and saturated fat is a needed item for the production of hormone cells and hormone function should make them uninterrogated at the PCOS woman's table. As will be discussed, fat-soluble vitamins A and D are so vital to PCOS women's reproductive health, that it would be quite negligent to neglect them in the PCOS woman's diet.

Sugar and Processed Carbohydrates

Visiting the cause of heart disease again, the main villain in cahoots with atherosclerosis is Metabolic Syndrome. This statement follows logic because those with metabolic syndrome are more likely to develop heart disease and atherosclerosis is the cause of heart disease. Consequently, it also applies to PCOS women. Those who develop Metabolic syndrome are more likely to develop atherosclerosis and heart disease. But, as mentioned in the long term risks of PCOS, why are PCOS women more likely to develop metabolic syndrome compared to other women? The pathology of metabolic syndrome leading to heart disease is this:

Metabolic syndrome is a biochemical situation in the body where hyperinsulinemia, too much insulin in the blood, is present and there is also too much glucose, or sugar, in the blood. Normally, when this biochemical situation is not present, blood sugar or blood glucose levels are kept under strict limits by the insulin produced by the pancreas. When we eat carbohydrates from fruit, vegetables, and grains, they are digested slowly and the molecules of glucose enter the bloodstream gradually. Glucose in the bloodstream triggers the pancreas to produce insulin. The presence of insulin is like a key that opens the door of cell walls to let the glucose in and be used up for energy and other needs of the cells. Any extra glucose that cells in the body do not need, insulin converts to body fat.

However, with metabolic syndrome and excess insulin in the blood or hyperinsulinemia, the cell walls become insulin resistant and destroy their cell "doors" so that insulin cannot keep opening them. As the glucose continues to enter the bloodstream from food, the pancreas keeps on producing insulin. Insulin levels become higher and higher, and the cells respond by becoming more and more insulin resistant. Glucose levels continue to rise to dangerous levels. Hyperinsulinemia and insulin resistance go hand-in-hand with obesity and therefore PCOS, because glucose cannot effectively enter cells to be used up, so insulin turns the excess glucose in the bloodstream into body fat.

Hyperinsulinemia creates a pro-inflammatory environment in the body. The biochemical homeostasis of the blood is not natural when excess insulin and glucose are present continuously. This inflammation injures the endothelium and cannot stop because of hyperinsulinemia. This begins the process of atherosclerotic plaque and type 2 diabetes. Diabetics suffer from atherosclerosis and die from heart attacks and strokes more than anyone else. Also, free glucose molecules in the bloodstream are very reactive, sticking to proteins in the blood which can stick to the walls of blood vessels, damage them and start the atherosclerotic process. They can also block small arteries and capillaries anywhere in the body and accumulate as amyloid, which can block capillaries in the retina, causing blindness, in the capillary bed of the kidney, causing kidney failure, in the brain, causing Alzheimer's disease, and in the capillary bed of male sexual organs causing impotence. Diabetics are much more at risk for blindness, kidney failure, impotence and memory loss because of this. (Campbell-McBride, Put 49-53)

Hyperinsulinemia is a recent, modern 20th and 21st century epidemic. Processed foods are also a recent, modern 20th and 21st century invention which are consumed in copious amounts by all people in the Western world, including babies when they are fed commercial formula. Metabolic syndrome is occurring in children at younger and younger ages. Polycystic Ovarian Syndrome is also occurring at higher and higher rates, and only occurs in the Western, industrial, affluent world where these foods are being consumed.

Processed foods are breakfast cereals, biscuits, breads, cookies, crackers, cakes, ice-cream, pastries, pastas, sweets in general, popcorn, jams, condiments, sugar and anything that contains it, preserved fruits and vegetables, soft drinks, processed fruit juices, frozen precooked meals. etc. Basically, anything that is no longer a whole food with some things taken out and others put back in order to prolong shelf life and then improve the denatured bad taste. These foods are devoid of fiber and nutrients. Unprocessed, fresh fruits and vegetables contain fiber which allows them to be digested slowly and glucose gradually enters the body. Fiber is vital because "fiber reduces the rate of intestinal carb absorption, reducing insulin response. It increases the speed of transit of intestinal contents to the ileum and induces satiety, which means you get your satiety signals sooner. Fiber inhibits absorption of some free fatty acids to the colon, which are metabolized by colonic bacteria to short chain fatty acids (SCFA), which suppresses insulin." (Lustig) Also, the entire whole food is not fructose or glucose. Other molecules in the food go into the bloodstream that are not sugar and therefore do not elevate blood sugar and insulin to unnatural levels. Fruit juice and preserved jams, for example, do not have fiber and enter the bloodstream so quickly and fully when consumed that a rapid increase in glucose takes place that is foreign to our physiology.

Plus, the majority of people subsist on processed and fast foods each day, everyday for every meal. Breakfast is breakfast cereal; lunch a sandwich of processed bread and sugary condiments; pasta or the like for dinner, and all consumption in between is cookies, candy, cake, sugar, chocolate bars and cups and cups of soft drinks. This happens from a very young age, starting with formula for many, and then processed baby foods and Cheerios. The first reaction is to store it as fat, producing the obesity epidemic. As it continues into adulthood, it produces obesity if not already, then diabetes, atherosclerosis and heart disease. A study from the Children's Hospital of Boston, Massachusetts showed that one soda per day increased the risk of cardiovascular disease by 20% and that processed fruit juices were not much better, having the same inflammatory effects

on the body. This same study looked at and proved inflammation as a cause for heart disease instead of assuming saturated fat and cholesterol were the culprits. (Nainggolan)

For women with Polycystic Ovarian Syndrome, not eating processed foods is their best medicine. Insulin resistance is the first step in the cascade that becomes PCOS. Not eating processed foods with sugar, artificial sweeteners, and processed flours is the only way to stop insulin resistance in its tracks. Names for sugar in processed foods include evaporated cane juice, corn syrup, corn sweeteners, high-fructose corn syrup, crystalline fructose, sucrose, malt, malt syrup, barley malt syrup, maltose, maltodextrin, dextrose, maple syrup, brown rice syrup, beet juice, muscovato, succanat, turbinado sugar, and invert sugar. All of these are molecules of glucose, fructose, maltose, or dextrose monosaccharides and all are converted to glucose or glycerine when consumed. (Shanahan, 225) Agave nectar is also a processed sweetener with ratios not found in nature because of the processing it goes through. Studies have shown that it contains more concentrated fructose than high fructose corn syrup and causes an increase in visceral fat and insulin resistance associated with heart disease, just like high fructose corn syrup. ("Agave")

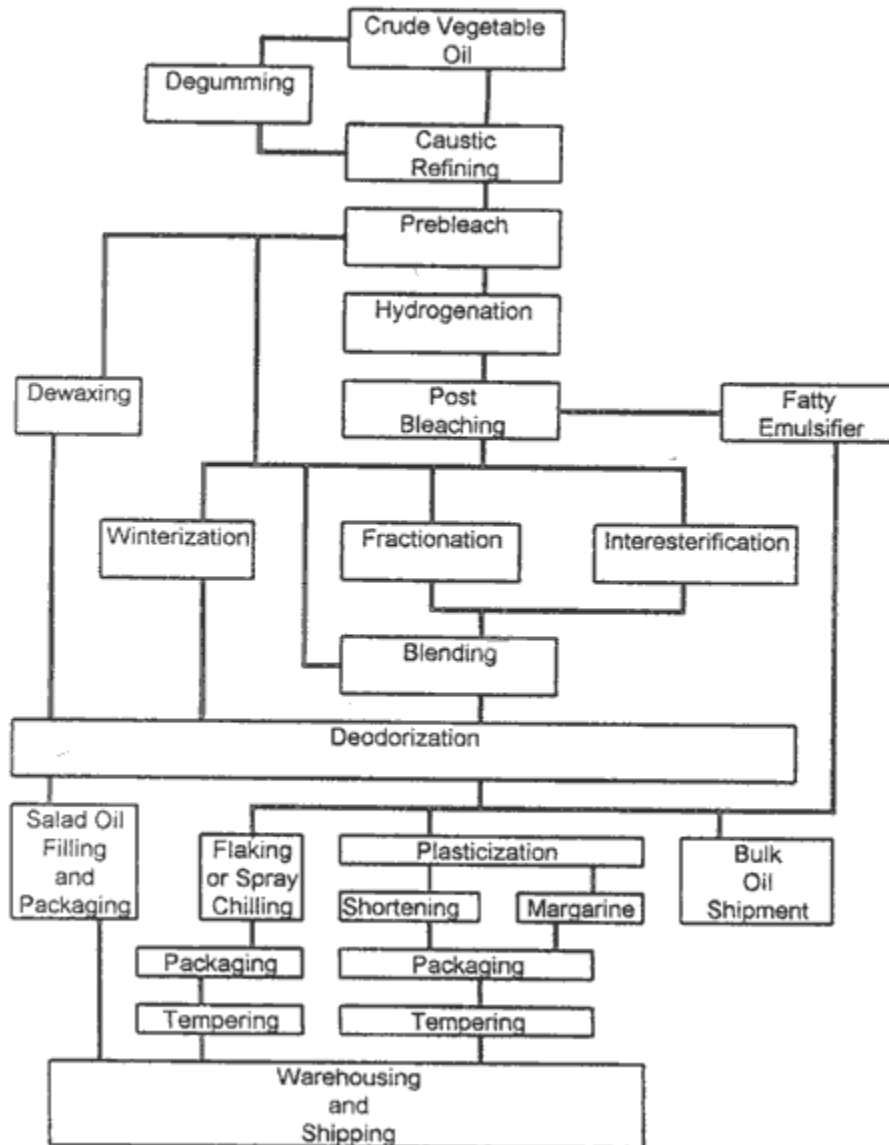
It should also be added that studies have shown that fructose can only be metabolized by the liver, and large amounts from our present diet cause harm the same as seen in alcohol-induced liver disease. Fructose also does not engage the receptors in the brain that produce leptin, the chemical that controls satiety, the way that glucose does. This causes people to eat more even when they may be full. That high-fructose corn syrup laced fizzy drink is going to make you eat the entire burger, instead of half, and have you go back for more, drink and fries. PCOS women are already at risk for liver disease. High fructose corn syrup must be avoided. (Lustig)

Vegetable and Industrial oils

Vegetable oil is the lipid, fat or oil, extracted from corn, canola, soy, sunflower, cottonseed, safflower, rice bran and grapeseed. It is found in almost all ready-made foods including granola, baked goods, cereal, chips, crackers, rice milk and soy milk, processed cheese, meat substitutes, frozen meals and salad dressings, even if they are advertised as an olive oil-based dressing. Old fashioned extraction of oil from flax and grapeseed involved using a wedge press. The wedge was tapped into the press a little further throughout the day until, ever so slowly, the oil would drip fresh and full of antioxidants and vitamins, without any heating. Today, vegetable oils are industrial oils, except for a few small enterprises which provide flax oil, and a few others, that are processed cold. Today, vegetable oils are extracted quickly and cheaply using high heat and hexane and then bleached and deodorized to be sold as the neutral, generally flavorless oils in the baking section and most foods.

Saturated and monounsaturated fatty acids are easily extracted at low temperatures, but vegetable oils require high temperatures for extraction and are more prone to side-reactions that polymerize and mutate the fat molecules. Organic, expeller-pressed canola oil may contain as much as five percent trans fats, cyclic hydrocarbons (carcinogens), and oxyphytosterols which are very damaging to arteries. These processed vegetable oils are mostly polyunsaturated fatty acids (PUFAs) and their unsaturated molecular make-up allows for oxygen molecules to bond and react easily. Example: TNT (trinitrotoluene) has six places where oxygen can react, where PUFAs have two, so it is literally an explosive. On a less extreme level, heating, cooking, and processing seeds into vegetable oils causes oxidation, a sort of explosion, which produces trans fatty acids. Trans

fatty acids are the precursor to free radicals that damage cell membranes, chromosomes and nearly every part of the body when consumed. Some experts describe them as “high-energy electrons that are involved in every known disease. They behave like molecular radiation, burning everything they come into contact with, inside your body and out.” (Shanahan, 171-184)



[photo source](#)

In addition to being full of trans fat, vegetable oils have a high omega 6 ratio compared to omega 3. Both omega 6s and omega 3s are vital, but they must be in the proper ratio. The diets of traditional societies, free of processed, industrialized foods, had what is thought to be a 1:1 ratio of omega 3 and omega 6. Today, an average person on the standard American diet consumes an average of omega 6 to omega 3 of 10:1 and some less conservative experts estimate it is 20:1. (Hutchins) Elevated consumption of omega 6 in relation to omega 3 is associated with all inflammatory diseases including cardiovascular disease, type 2 diabetes, obesity, metabolic syndrome, irritable bowel syndrome and inflammatory bowel disease, macular degeneration,

rheumatoid arthritis, asthma, cancer, psychiatric disorders and autoimmune diseases. (Kresser) A basic study from the Food Security and Nutrition Research Center of Iran showed that women who consumed hydrogenated vegetable oils had biomarkers for inflammation and endothelial dysfunction. (Esmailzadeh and Azadbakht)

Oil	Omega-6 Content	Omega-3 Content
Safflower	75%	0%
Sunflower	65%	0%
Corn	54%	0%
Cottonseed	50%	0%
Sesame	42%	0%
Peanut	32%	0%
Soybean	51%	7%
Canola	20%	9%
Walnut	52%	10%
Flaxseed	14%	57%
Fish*	0%	100%

[photo source](#)

A high ratio of omega-6 to omega-3 causes endocannabinoid overproduction or hyperactivity, resulting in obesity. Linoleic acid, omega-6, has an obesity causing effect when not balanced with, a-linoleic acid, omega-3. Endocannabinoids are responsible for signaling hunger to the brain. Too many endocannabinoids makes people eat more and more, even when they are full. No wonder people cannot stop eating those chips once they have one. (Alvheim, et al) (IACM) (“How Vegetable”)

In addition to making people eat more, vegetable oils also impair vitamin absorption.(Shanahan, 175) For childbearing women, it should be considered that oxidative stress was found in the blood of mothers who had babies with congenital spinal and heart defects. As discussed above, oxidation occurs when vegetable oils are consumed. Research has also shown that oxidative stress disrupts hormone production and hormone responses. Women who are pregnant or may become pregnant, with cells producing and dividing in such quantity and so quickly, have a large possibility of mutation and disease when the new cells are being built on oxidized, carcinogenic fats and oils. (Shanahan, 199)

Based on this research, women with polycystic ovarian syndrome, and anyone really, should not consume vegetable oils because of their risk and tendency for obesity, heart disease, hormone imbalance and infertility and the effect that vegetable oils, trans fats, and high ratio of omega-6 have on these diseases. Good olive oil and flaxseed oil can be used as salad dressings and otherwise cold in small amounts, but all other vegetable oils and foods containing them should be avoided for optimizing healing, balance and fertility.

Animal Products

Since the late 20th century, research has been analyzed and produced to support the idea of a vegetarian or vegan diet to combat western diseases like heart disease, diabetes, obesity and cancer. A lifestyle diet free of animal products is often promoted for PCOS women because of these touted benefits including solving diabetes and obesity, and reducing risk for heart disease and cancer. There have been some references to eliminating animal products in the diet to reduce estrogen intake and improve hormone balance in PCOS women also.

The China Study by Colin T. Campbell and several other medical doctors and researchers is a comprehensive survey from the 1970s looking at the diet of the Chinese people and their disease rates. The study concluded that animal proteins in excess lead to western diseases including obesity, diabetes, heart disease, and cancer. The conclusions of the study have been accepted by many, but others who have studied the original China Study data have found fallacies and come to other conclusions from the same data. Women with polycystic ovarian syndrome who are considering a vegan or vegetarian diet to improve their health, need to look at the China Study and the work of Mr. Campbell and then experts' qualms with the study, to make an informed decision for their own health.

Concerns with the reliability of the study on the hypothesis that animal protein feeds cancer includes the use of dairy casein in the laboratory testing. Whole dairy includes casein and whey and whey has been shown to be protective against cancer. Campbell also linked cancer with animal protein by way of cholesterol. Disease from cholesterol has not been proven and cholesterol may actually be important in fighting disease, as discussed earlier. "Notice Campbell cites a chain of three variables: Cancer associates with cholesterol, cholesterol associates with animal protein, and therefore we infer that animal protein associates with cancer. Or from another angle: Cancer associates with cholesterol, cholesterol negatively associates with plant protein, and therefore we infer plant protein protects against cancer." Looking at the data, there was no statistically significant data to draw this conclusion.

Campbell correlates breast cancer risk with the consumption of fat and animal protein, because people groups with younger first menstruation eat more of these and have a higher breast cancer risk. But correlation is not causation, and sugar, alcohol and starch correlate even more strongly with breast cancer. "Certainly, consuming dairy and meat from hormone-injected livestock may logically raise breast cancer risk due to increased exposure to hormones, but this isn't grounds for generalizing all animal products as causative for this disease. Nor is a correlation of +18 for fat calories grounds for indicting fat as a breast cancer risk factor, when alcohol, processed sugar, and starch correlate even more strongly. (Animal protein itself, for the record, correlates with breast cancer at +12—which is lower than breast cancer's correlation with light-colored vegetables, legume intake, fruit, and a number of other purportedly healthy plant foods.)" (Messinger)

China's Tuoli county, whose people consume high levels of animal products, was excluded from the survey on the basis of their nomadic migration, even though they consume dairy all year long. Their level of chronic western disease is not higher than other counties in China cited in the China Study. (Messinger)

Diet books based on the China Study include Eat to Live by Joel Fuhrman M.D., Diet for a New America by John Robbins, The Food Revolution: How Your Diet Can Help Save Your Life and Our World by Robbins and Dean Ornish, M.D., Everyday Happy Herbivore by Lindsay S. Nixon, Healthy Eating, Healthy World: Unleashing the Power of Plant-Based Nutrition by J. Morris Hicks, and Whole: Rethinking The Science of Nutrition by Colin T. Campbell. The documentary *Forks over Knives* featuring Colin Campbell and Dean Ornish is also based on the China Study.

A whole-foods plant-based diet will always improve health compared to a processed preserved food, high-carbohydrate, sugar laden diet. The question is, what is best for people over the long term? PCOS women do indeed need to detoxify their bodies in order to heal. PCOS women also need plenty of clean saturated fat and cholesterol to change the chemical climate in their body, heal, and achieve optimal fertility and long term health.

Genetically Modified Organisms

For hundreds of years, gardeners, farmers and scientists have been cross-breeding plants and animals within the same species to create one breed with the most desirable traits. Genetically modified organisms (GMOs) were first introduced into the food supply in 1994 when foreign genetic proteins from other species were introduced into the DNA of plants and animals. The goal was to produce food with higher nutrient content. Unfortunately, that goal has not been met, plus GMOs are grown with more pesticides and herbicides compared to conventional crops.

The Institute for Responsible Technology concluded in 2009 that, “The only published human feeding study revealed what may be the most dangerous problem from GMO foods. The gene inserted into genetically modified soy transfers into the DNA of bacteria living inside our intestines *and continues to function*. This means that long after we stop eating GMOs, we may still have potentially harmful genetically modified proteins produced continuously inside of us. Put more plainly, eating a corn chip produced from Bt corn might transform our intestinal bacteria into living pesticide factories, possibly for the rest of our lives. When evidence of gene transfer is reported at medical conferences around the US, doctors often respond by citing the huge increase of gastrointestinal problems among their patients over the last decade. Genetically modified foods might be colonizing the gut flora of North Americans.”

The Institute for Responsible Technology also reported that, “The experience of *actual* GM-fed experimental animals is scary. When GM soy was fed to female rats, most of their babies died within three weeks—compared to a 10% death rate among the control group fed natural soy. The GM-fed babies were also smaller, and later had problems getting pregnant.

When male rats were fed genetically modified soy, their testicles actually changed color—from the normal pink to dark blue. Mice fed genetically modified soy had altered young sperm. Even the embryos of genetically modified fed parent mice had significant changes in their DNA. Mice fed genetically modified corn in an Austrian government study had fewer babies, which were also smaller than normal.

Reproductive problems also plague livestock. Investigations in the state of Haryana, India revealed that most buffalo that ate genetically modified cottonseed had complications such as premature deliveries, abortions, infertility, and prolapsed uteruses. Many calves died. In the US, about two dozen farmers reported thousands of pigs became sterile after consuming certain

genetically modified corn varieties. Some had false pregnancies; others gave birth to bags of water. Cows and bulls also became infertile when fed the same corn.” (Smith)

For these reasons, studies show that PCOS women, and all childbearing women really, should avoid genetically modified foods. Fortunately, soy products and corn products are already not recommended for PCOS and childbearing women because they are so processed and usually contain other harmful ingredients. The best way to avoid GMO is to eat organic, avoid processed foods and know your farmer and food source.

Addictive substances

Alcohol and smoking cannot be consumed by women with PCOS because of the risk for hypertension and heart disease that goes with them. (Mayo clinic, “High blood”) Toxic substances, which smoking is, is a potential cause for PCOS. Alcohol, basically fermented sugar, spikes insulin and glucose leading to the issue of insulin resistance, the pathology of PCOS. It also affects gut flora and abnormal gut flora is a potential cause of PCOS.

Several studies have shown that large amounts of caffeine affect hormones and fertility whether from coffee or other substances like soda and chocolate. In a study published in *Fertility and Sterility* in 2001, women who consumed more than 100 mg of caffeine or two cups of coffee per day had significantly higher estradiol levels during the follicular phase of their cycle and women who consumed more than 500 mg of caffeine had 70% more estradiol in their blood. (Lucero, et al) This, of course, affects ovulation since the follicular phase must produce an ovum under a hormonal imbalance. A study from the Division of Research at Kaiser Permanente showed that high intakes of caffeine, 200 mg or more per day, during pregnancy increased the risk of miscarriage. (Wend, Odouli and Li) A study from the Nevada School of Medicine showed that high caffeine intake compromises fallopian tube cilia and specialized pacemaker cell activity so that ovum do not move through the fallopian tubes as effectively. The researchers are studying further to see if this could be linked with ectopic pregnancy. (McMillin) By this evidence, it is highly recommended that PCOS women avoid smoking, alcohol and caffeine as much as possible.

Exercise

Exercise is an important part of healing from PCOS because of its effects on weight loss, which is vital to obese women with PCOS, and because it lowers hypertension risk, (Mayo clinic, “High blood”) relieves stress, and plays an essential role in the treatment and prevention of insulin resistance (Borghouts and Keizer). From the studies by Duncan et al, it is concluded that “Exercise with or without weight loss improves insulin sensitivity. As already noted, it is well established that acute exercise is associated with substantial improvement in insulin sensitivity independent of any change in cardiorespiratory fitness or body composition. The fact that the beneficial effects of acute exercise diminish quickly simply implies that exercise should be performed on a regular basis, a notion entirely consistent with the recommendation from the U.S. Centers for Disease Control and Prevention, that regular physical activity such as brisk walking for 30–60 min, be performed on most days of the week. Furthermore, given that weight loss reverses the insulin resistance that is characteristic of obesity, it is reasonable to suggest that the beneficial impact of daily exercise on insulin resistance would be magnified if associated with diminished body weight and/or body fat. Indeed, combined with the fact that modest exercise reduces the morbidity and mortality

associated with cardiovascular disease and diabetes, it is difficult to imagine a more effective therapeutic strategy for reducing insulin resistance and, more importantly, improving overall health and wellbeing.” (Ross, “Does Exercise”)

Environmental Changes

Toxins are a potential cause for PCOS which is not fully understood or explainable. However, PCOS women should still know that it is a potential cause and that reducing their toxic exposure, is beneficial for their health and that of their offspring. Even if considerable improvement in PCOS symptoms is not seen, reducing toxin exposure is beneficial for general overall health and the health of the liver in the longer term.

Much of the human exposure to toxins is from what is applied dermatologically and absorbed into the bloodstream, inhaled in the air or consumed in our food. Cosmetic products, make up, shampoo, conditioner, hair spray, toothpaste, cleaners, feminine hygiene products and plastic all contain toxic chemicals. Toothpaste especially, often contains fluoride. It is known that toxic chemicals affect hormonal health and consequently, fertility.

Parabens, a chemical used to prevent bacterial growth in cosmetic products, is a known hormone disruptor as it mimics estrogen by binding to estrogen receptor sites. “They also increase the expression of genes usually regulated by estradiol (a form of estrogen); these genes cause human breast tumor cells to grow and multiply in cellular studies.” A database that compares over 50 international toxicity databases “ indicates that parabens are linked to cancer, endocrine disruption, reproductive toxicity, immunotoxicity, neurotoxicity and skin irritation. Since parabens are used to kill bacteria in water-based solutions, they inherently have some toxicity to cells.” “Parabens appear mostly in personal care products that contain significant amounts of water, such as shampoos, conditioners, lotions and facial and shower cleansers and scrubs. While concentration limits are recommended for each paraben, these recommendations do not account for the use of multiple parabens in a single product or for exposure to parabens from several products by a single individual.” (“Parabens”)

Phthalates are another common group of chemicals added to cosmetics but also food packaging, children’s toys, paint, wax, cleaners and more. A study from the Journal of Toxicology reported that mice exposed to phthalates experienced reproductive abnormalities, and according to a study done by a Dr. Grindler, women who had the highest levels of phthalates in their blood were found to start menopause a full 2.3 years before the other women. For women who postpone childbearing to later in life or struggle with infertility, early menopause is the last thing they need. (Pope)

PCOS women should consider evaluating their cosmetic and personal hygiene products to transition into a non-toxic lifestyle. There are many brands on the market in addition to options that can be made from basic ingredients at home. Plastic, especially heating food and for storing food, should also be avoided because of the BPA content. Organic food, as opposed to conventionally grown, should be consumed as much as possible because of the effect herbicides and pesticides have on hormones and fertility.

Night Lighting/Phototherapy

Night lighting, also called phototherapy or lunaception, is the use of artificial light when sleeping during particular times of the month to regulate ovulation and the menstrual cycle. Often used for promoting fertility or natural family planning, night lighting is based on stories from the beginning of time and being promoted and understood today through modern research.

Louise Lacey, a writer in the 1960s, discovered the effects of night lighting when no longer taking oral contraceptives and having irregular cycles. Incomplete sentence here After reading about the circadian rhythm and the sexual cycles of some primates which suggested peaks of sexual activity and ovulation in relation to the lunar cycle, she started wondering if the moon's cycles relate to human reproduction. She also wondered artificial light interrupts the moon's effect on women's cycles. Soon thereafter, she discovered an article by John Rock, OB/GYN, and E.M Dewan, a physicist, on their discovery that when women's cycles regulated when they started sleeping in complete darkness on Days 1 through 13 of their cycle, sleeping with a 100-watt bulb on all night (under a lampshade in their bedroom) on Days 14-17 and then returning to sleeping in complete darkness until their next menstrual cycle began. Their study included 41 women and the women not exposed to the regimen of late had varied cycles from 25 to 38 days, whereas the women with the regimen of light reflecting that of the moon had 29 day cycles. ("The Science")

Once Lacey knew this discovery, she began to chart her basal body temperature with the experimental night lighting guidelines of Rock and Dewan to find that the three nights of sleeping with light triggered ovulation. Lacey named the technique "Lunaception", finding it could be used as a natural form of family planning. She then went on to conduct a small study with twenty-seven of her friends who successfully used lunaception to develop regular, healthy menstrual cycles and avoid pregnancy effectively all the way through menopause.

The Couple to Couple League, which has taught Natural Family Planning since 1971, conducted a study to see if women with very long or very short cycles could develop a more normal cycle length with the concept of lunaception. 92% of the women in the study experienced reduction in cycle irregularity. In 1976, Joy DeFelice, a Natural Family Planning teacher and registered nurse taught her students the concepts of lunaception and found that sleeping in darkness alone, and seldom in light, normalized their hormonal patterns. Together, the Couple to Couple League and Joy DeFelice found their research showed that eliminating light helped women create healthy menstrual cycles in a variety of situations: (Singer, "Fertility")(Singer, 161)

- Women with anovulatory cycles became ovulatory.
- Women with unclear mucus readings developed discernible, healthy mucus buildup.
- Ovulation occurred in synch with fertile mucus buildup.
- Cycles that had been short (twenty-six days or less) or very long (thirty-five days or more) became twenty-seven to thirty-one days long.
- FSH levels became healthy.
- Spotting at various times during the cycle was significantly reduced.

- Progesterone levels were strengthened.
- Women with a history of miscarriage (s) were able to sustain pregnancy.
- During breast-feeding, an infertile mucus pattern was easily established.
- During weaning or bottle-feeding, sleeping in darkness (and then introducing light during a slippery mucus patch) helped trigger a return to ovulatory cycles.
- Premenopausal women developed a more discernible mucus pattern; and the intensity of their premenopausal symptoms, including hot flashes, sleeplessness, and mood changes, was reduced. (Singer, 161)

The circadian rhythm of the moon is responsible for the phenomenon of lunaception because the pineal gland in the brain, responsible for regulating sleep, appetite and the onset of puberty, is regulated by melatonin. In order to be produced, it must be night and it must be dark as bright light suppresses melatonin secretion. The hypothalamus gland, also in the brain, is richly supplied with melatonin receptors and responsible for the body's overall homeostasis including blood pressure, emotions, temperature, and the endocrine system. The hormones from the hypothalamus stimulate the anterior pituitary gland to secrete its hormones, which then stimulate the thyroid, adrenals and the ovaries. Interestingly, the ovaries also have melatonin receptors. Consequently, the absence or presence of melatonin and light or darkness while sleeping has a large impact on the menstrual cycle. Without the melatonin produced from sleeping in darkness, the hypothalamus will not have what it needs to function for optimal fertility. (Singer, "Fertility") (Weaver) (Singer, 158-163)

After the research of Rock and Dewan concluding that, "we have statistical evidence that this regimen of photic stimulation can regularize the length of the menstrual cycle and can presumably influence the time of ovulation," other researchers have repeated the same findings. The Sleep Center at the University of California conducted a clinical study with 16 women showing that, on average, a 45 day cycle was reduced to 33 days with the placebo having no effect. In another study from 2002, "reduction of the treated cycle was substantial" with evidence showing an average of 20% reduction resulting in cycles less than 33 days, on average. ("Clinical") A study from 2007 concluded that phototherapy or lunaception "is a promising method to overcome infertility." (Danilenko and Samoiloova)

To practice lunaception with all of its proven benefits, women must sleep in total darkness meaning after fifteen minutes of the lights off, they still cannot see their hands in front of their face. Bedroom windows may need to be covered with room-darkening blinds or curtains backed in light-blocking fabric. Light from under the door can be blocked with a towel and all light from technological devices like computers, phones, and digital clocks, also needs to be covered up and blocked. (Singer, 158-163)

Supplementation

Vitamin D

Vitamin D is necessary to make sex hormones and helps regulate cell growth and differentiation. (Planck, What 59) It has been shown that Vitamin D plays a crucial in blood sugar

metabolism and is beneficial for preventing diabetes, metabolic syndrome, and insulin resistance. Studies have shown that low levels of Vitamin D are linked to higher rates of insulin resistance, weaker pancreatic function and obesity. In one study of thirteen women with PCOS, when treated with Vitamin D supplementation, all of the women with irregular menstruation or dysfunctional bleeding had regular menstruation and no dysfunctional bleeding or became pregnant after 2 months. ("Vitamin D") This study was done in New York City in 1999 and it is interesting that calcium therapy was added to the Vitamin D supplementation (Thys-Jacobs, et al) as Vitamin D is required for proper calcium metabolism. (Masterjohn) In a 2011 study from Austria, it was found that low levels of Vitamin D were linked to PCOS and the metabolic and endocrine disruptions associated with it. (Wehr, et al)

It is estimated that 40% of Americans are Vitamin D deficient, as fewer and fewer Americans spend time outdoors, sunscreen blocks the production of Vitamin D and Vitamin D is only found in oily fish, cod liver oil, butter and lard from animals that get ample amounts of sunlight and Vitamin D fortified milk and breakfast cereals. According to one report, it is suggested that adequate Vitamin D levels can be supplied by daily exposure of the face and arms to the sun for 15 minutes. If this cannot be achieved, supplementation is suggested. The Food and Nutrition Board of the National Research Council suggests that long-term vitamin D intake of up to 2,000 IU per day is unlikely to have any adverse effects among the general population. Although, those who are diabetic, obese, vegetarian, live in a northern latitude or cloudy climate or have PCOS may be deficient and should be tested by a doctor to determine if a higher dosage would be beneficial. Extremely high dosages of Vitamin D can be toxic when sustained over a long period. ("Vitamin D") ("PCOS and")

Cod Liver Oil

Cod liver oil is a superfood source of Vitamin A and D, elongated omega-3 fatty acids, docosahexaenoic (DHA) and eicosapentaenoic acid (EPA) which is a precursor to prostaglandins. (Sullivan) (Fallon, 237, 618-619) The merits and importance of the fat-soluble Vitamin D for health and healing from PCOS have been mentioned previously. Additionally, the fat-soluble Vitamin A is the catalyst for all biological processes and vital for efficient mineral uptake and utilization of other water-soluble vitamins (Fallon, 544). Deficiency has been found to produce a disturbance in ovulation resulting in sterility (Fallon, 302-303) and irregular patterns of cervical fluid. Vitamins A and D are vital for estrogen, progesterone, testosterone and adrenal hormone production. (Singer, 167-168)

Cod liver oil has been shown to greatly improve heart function and prevent heart disease and treat it even in advanced stages after a heart attack or surgery by altering the lining of the arteries to foster healing. Conditions from low levels of fat-soluble vitamins and omega-3 fatty acids like Syndrome X and related pathology including obesity, hypertension, insulin resistance, adult onset diabetes and stroke are addressed by cod liver oil. (Sullivan) Because PCOS women are at greater risk for these conditions, if they are not currently diagnosed with them, cod liver oil is beneficial and preventative, in the least, if not a stepping stone to remission or cure, at the most.

Vitamin A and D, and any vitamins from foods, come with many cofactors like enzymes and related vitamins and minerals which work together to ensure that everything is properly absorbed and can be used to its fullest extent by the body. Synthetic vitamins are made "from scratch" in

laboratories, and crystalline vitamins are extracted from natural sources by chemical means. These vitamins act more like drugs in the body and can disrupt body chemistry and cause many imbalances since they are purified and fractionated from their cofactors. Vitamins from non-food sources may not have the beneficial effects on the body or any at all. For example, synthetic vitamin C is not as effective at curing scurvy compared to fresh citrus juice; synthetic vitamin B from coal tar did not cure beriberi in Korean POWs when rice polishings with natural vitamin B complex did; and synthetic betacarotene given to smokers actually increased their rate of cancer instead of being protective from cancer like the betacarotene found in fruits and vegetables. (Fallon, 108)

Vitamin A toxicity has been a serious concern for the modern person with recommendations to avoid liver, cod liver oil and other foods high in vitamin A. (Fallon and Enig) It has been discovered that as of the 1930s, healthy primitive peoples consumed ten times more vitamin A than the typical American diet at the time. The disparity of vitamin A consumption is estimated to be even higher today, as it is only found in animal foods. (Fallon, 544) Betacarotene found in plant foods needs large amounts of enzymes to be converted to vitamin A. Conversion of betacarotene to bioavailable vitamin A is inhibited by being an infant or child, diabetes, low thyroid function, low fat intake, intestinal round worms, diarrhea, pancreatic disease, and celiac disease. (Fallon and Enig)

The US Recommended Daily Allowance (RDA) of vitamin A is 1000-2000 IU for children, depending on age, 2330 IU for women and 3000 for men. Toxicity for vitamin A in emulsified, water-miscible (mixable in water), and solid form is ten times more toxic compared to vitamin A taken in oil-based preparations. This works out to about 200,000 IU per day for adults and 20,000 IU per day for children of oil-based preparation and 40,000 IU per day for adults and 4,000 IU per day for children of water-miscible, emulsified and solid preparations. (Wetzel) In one serving of high-vitamin, fermented cod liver oil there is about 25,000 IU of vitamin A and 1,500 IU of vitamin D, well below potentially toxic amounts. It is estimated that the diets of healthy primitive people had 50,000 IU of Vitamin A in their diets from natural animal sources per day. (Fallon and Enig)

Interestingly, studies have shown and research has accumulated to prove that vitamins A and D in conjunction protect against the toxicity of the other. Vitamin D can only do its job effectively in the presence of vitamin A because vitamin A is its required signaling partner when coming into contact with the nucleus of cells. In 1998, scientists showed that even moderate doses of vitamin D, whether from light or the diet, lower blood levels and liver stores of vitamin A. In other words, vitamin D uses up vitamin A in large amounts in order to function. Without adequate stores of vitamin A, vitamin D can just sit around, not perform tasks, and become toxic in the body. Additionally, there will not be vitamin A for other tasks in the body like ovulation. When vitamin D is in short supply and vitamin A is adequate or excessive, vitamin A can then become toxic through excess cell signaling and body chemistry disruptions or liver damage since vitamin A is stored in the liver. In essence, toxicity of either vitamin is a concern when either is in short supply. Cod liver oil has been a food supplement for thousands of years for the young and old with the potential to have the perfect, nature-made balance of vitamin A and D. (Masterjohn, "The Cod")

All cod liver oils in the United States must be tested according to the protocols of Association of Analytical Communities (AOAC) and be approved free of detectable contaminants, including heavy metals such as mercury, cadmium, and lead and PCBs before they can enter the country. Furthermore, mercury is water-soluble and found in the flesh of fish but not in the oil of the liver. Cod liver oil can become rancid if not handled properly. Although having 21 percent

saturated fatty acids and 57 percent monounsaturated fatty acids, it is relatively stable. It is recommended that buying large bottles or “economy size” be avoided for smaller dark, glass bottles to ensure that it can be assured fresh until it is used up, preferably by two months of opening. (Sullivan)

Researchers, medical professionals and anecdotal evidence has shown that cod liver oil does not have profound impact on the body unless in combination with saturated fats and fatty acids like butter and high-vitamin butter oil. This may be for a number of reasons. First, cod liver oil is known to be rich in EPA which is needed for the omega-3 pathway. Alternatively, high vitamin butter and oil can be rich in arachidonic acid (AA) which is needed for the omega-6 pathways. Together, these omega pathways are vital for health and reducing inflammation which is one cause for nearly all modern diseases, including PCOS. Another reason for the effectiveness of the cod liver oil and butter oil combination is probably due to the fact that the unsaturated fatty acids of the cod liver oil cannot be assimilated and stored in the tissues without the adequate saturated fatty acids provided by butter oil, not to mention that vitamins A and D are fat soluble and butter is unmistakably fat. (Sullivan) (Fallon, 472) Third, research that began at the beginning of the 20th century on a mysterious activator which worked synergistically with vitamin A and D has recently been scientifically explained to be vitamin K2, which furthers the proposition that butter oil is vital to the success of cod liver oil. (Masterjohn, “On the Trail”)

Not all cod liver oil is created equal, as some oils go through processes which remove nearly all of the naturally occurring vitamins. Some manufacturers add synthetic vitamins to the oil to make up for this and others add the natural vitamins removed during processing back into the cod liver oil. Fortunately, there is cod liver oil available in the United States that is not processed through heat and is fermented the traditional primitive way, shown to have the best nutritional benefits. This cod liver oil is sold as a food and does not have the vitamin content on the label but after numerous tests, “the approximate values of A and D have been ascertained at 1900 IU vitamin A per mL and 390 IU vitamin D per mL. Thus, 1 teaspoon of high-vitamin fermented cod liver oil contains 9500 IU vitamin A and 1950 IU vitamin D, a ratio of about 5:1.” Daily dosage recommendations are one teaspoon for children over twelve and adults, and two teaspoons for nursing and pregnant women. Cod liver should be taken with meals as it aids in the utilization of the minerals in the food and with either high vitamin butter oil or other saturated fats. (Fallon and Enig, “Cod liver oil”) Flax seed oil is not a good substitute for cod liver oil because it does not contain large quantities of vitamin A and D. (“Why”)

Zinc

The mineral zinc is essential for fertility, in that mature ovum production requires it, proper fallopian tube fluids are maintained with it and hormone levels, including progesterone, estrogen and testosterone, are kept stable with it. Low levels have been directly linked to miscarriage in the first trimester and supplementation has shown to reduce the size of fibroids in addition to supporting fertility. (3) Zinc is also required for normal growth and healing and the absorption of vitamin A. (Singer, 173)

Poor soil health, a spreading problem, fails to provide zinc for growing crops. Additionally, the heating, cooking and general processing of food reduces zinc amounts in food up to 50%. Constant exposure to pollution, habits of alcohol or smoking, sugar (Singer, 173), trans fats (Planck,

Mother 63-65) and the stress hormone cortisol reduce zinc levels in the body. (3) Oral contraceptives diminish zinc levels and low zinc levels can result in birth defects. Consequently, pharmaceutical companies recommend waiting at least six months after discontinuing oral contraceptives before trying to conceive. Phytic acid in grains, soy (Planck, Mother 63-65) and legumes can block absorption of zinc; therefore, it is recommended that grains and legumes go through a soaking process or fermentation before being consumed, just as primitive cultures always did. (Singer, 173)

Oysters have 5.2 mg zinc each, clams have 3mg zinc per cup, beef has 9.7 mg zinc per 4 oz, chicken has 3.2 mg of zinc per 4 oz. dark meat, cashews and sunflower seeds have 3 mg. zinc per half cup, cooked lentils have 1.5 mg. zinc per cup and sprouted mung beans have 1.89 mg zinc per cup. (Singer, 173) Yogurt, turkey, green peas and shrimp also contain zinc. The daily recommended supplementation amount for zinc is 15 mg. (3) The recommended daily allowance for pregnant and nursing mothers is 20-25 milligrams. Some nutritionists and fertility experts recommended 80 milligrams for infertility. It is estimated that ninety percent of people in the modern world may be deficient of this mineral. White spots on the finger nails are the tell tale sign for zinc deficiency. (Planck, Mother 63-65) (Singer, 173) Anorexics, vegans, vegetarians and those who eat soy instead of meat are more likely to be deficient. (Planck, Mother 63-65)

Evening Primrose Oil

Evening primrose oil (EPO) is found in the seeds of the evening primrose plant which is a wildflower native to North America and also found in Europe and parts of the Southern Hemisphere. It acquires its name from its similarity to primrose flowers and the fact that it blooms yellow in the evening. A large portion of EPO is essential fatty acids (EFA) called gamma-linolenic acid (GLA) which are required by the body and must be obtained through the diet. Essential fatty acids are responsible for giving energy, maintaining body temperature and metabolism, insulating nerves, cushioning and protecting tissues and are the structure of every cell in the body. In addition, essential fatty acids are the precursors to prostaglandins. (Graham, 24)

EFA deficiency has been shown to produce unpleasant symptoms like abnormalities of the heart and circulation, poor skin, wounds that do not heal properly, inability to reproduce (especially in males), inflammatory disorders and arthritis, failure of normal brain development, dried up tear ducts and salivary glands and faulty immune function. (Graham, 25) There are a wide array of foods that contain essential fatty acids, but blocking agents like trans fatty acids, diabetes, aging, viral infections, radiation and zinc deficiencies do not allow the EFA to always be utilized properly, resulting in much EFA deficiency in the western world. Evening primrose oil is 70% cis-linoleic acid and about 9% cis-gammalinolenic acid with the active ingredient being gallalinolenic acid. Because of these properties, EPO is biologically active in the body, whereas linoleic acid, an EFA found in foods, is not biologically active and has to be converted to GLA in the body before it can be converted into prostaglandins. Linoleic acid is unable to be used by the body because of the aforementioned blocking agents. (Graham, 26-30)

The fact that EFA is the precursor to prostaglandins is important, because prostaglandins act as vital regulators which regulate every cell in our bodies. Similar to hormones, prostaglandins control what each cell is doing making them vital to the entire body and giving testament to why evening primrose oil is effective for a wide variety of conditions.

Several clinical trials have consistently shown that polyunsaturates that contain essential fatty acids, which are the precursor to prostaglandins, lower cholesterol, reduce the clumpiness of platelets, lowers blood pressure and reduces the risk of thrombosis in both animals and humans. (Graham, 45-47)

Unintentionally, during a trial on the effects of evening primrose oil on schizophrenic patients at Bootham Park Hospital in York, it was discovered that those who were more than 10% above their ideal body weight lost weight while taking evening primrose oil. There had been no changes to their diet. Other studies have shown that essential fatty acid content of body fat is inversely proportional to body weight i.e. the higher the levels of EFAs in the body, the lower the body weight and vice versa. It has been shown that the gammalinolenic acid in evening primrose oil has a stimulating effect on adipose tissue, possibly because the prostaglandins accelerate the activity in the adipose tissue. (Graham, 48-49)

When essential fatty acids were first being researched and rats were starved of EFAs in their diet, their skin showed the most obvious signs of deficiency. Sebum production increased, sebaceous gland size increased, resulting in acne. They developed a dandruff-like condition of their fur, lost some of their fur, and a condition resembling eczema also developed.

In one study on the impact of evening primrose oil on diabetics with neuropathy, it was found that defects with essential fatty acid metabolism may lead to the nerve damage. (Connor) ("Evening Primrose Oil") Over 100 patients with mild nerve damage were given six evening primrose oil capsules twice a day for a year, the others, placebo. Sixteen measures of nerve function were followed. Every measure improved in the group on EPO in comparison with the group on placebo. For thirteen of the sixteen measures, the improvement was statistically significant. Interestingly, the treatment was more effective in those patients who were better at keeping their blood sugar relatively normal. In another study, it was found that diabetics who were given more linoleic acid were less likely to die of cardiovascular disease and evidence indicated that an essential fatty acid rich diet protected the kidneys. ("Evening Primrose Oil")

Evening primrose oil is said to promote fertility because it aids in the production of fertile quality cervical fluid, the kind that is thin, watery, clear and stretchy or "egg white cervical mucous." (Grimes) By promoting blood flow, the GLA in evening primrose oil improves uterine function and may assist those who are unable to conceive. For the same reasons, male impotence can be improved with EPO supplementation also by increasing penile blood flow and circulation. In addition, EPO supplementation may be beneficial for balancing hormones, because it has already been found to be beneficial for PMS, menopause, menstruation, endometriosis, and breast pain because of the anti-inflammatory prostaglandins that are promoted with EPO. ("EPO Oenothera")

For all of the above benefits, evening primrose oil supplementation is beneficial for women with PCOS and may be a prescribed option by care providers to help with PCOS symptoms. Because researchers are also coming to understand the role of inflammation and oxidation in the development of diabetes and heart disease, evening primrose oil is again a good option because of its preventative nature in reducing inflammation and simultaneously diabetes and cardiovascular disease. (Shanahan, 289)

The most common side effects of evening primrose supplementation are nausea and head ache which generally go away over time or are alleviated through taking it with food. (Graham, 91-92) People taking blood thinning drugs, drugs for schizophrenia or epilepsy or who are pregnant or breastfeeding should avoid using evening primrose oil because of possible drug interactions. (Grimes)

It should be considered that some evening primrose oil supplements or prescriptions, like Efamol, are not 100% evening primrose oil. Other oils, like safflower oil, make up a percentage of the supplement which may not or are not as beneficial. (Graham, 95) Borage oil and black currant are also beneficial because they contain essential fatty acids. These oils are also less expensive. In a study from 1988 published in Medical Science Research, evening primrose oil produced up to ten times more prostaglandins compared to these oils, making EPO the most effective for the aforementioned clinical indications. ("Evening Primrose Oil")

Liver

Liver is a nutrient-dense superfood when consumed. It offers high-quality protein, large amounts of vitamin A, all of the B vitamins, including B12, bentaine, choline, folic acid, iron, copper, zinc, magnesium, selenium, phosphorus, calcium, CoQ10-- an antioxidant and nutrient important for cardiovascular function, and purines-- the precursors to DNA and RNA. Liver, compared to an apple, has more nutrition in every area except for vitamin C and is between 10 and 100 times more nutritious compared to other red meat. That is nutrient density per gram. (McGruther)("Radiant")("What's More")

	APPLE (100 g)	CARROTS (100 g)	RED MEAT (100 g)	BEEF LIVER (100 g)
Calcium	3.0 mg	3.3 mg	11.0 mg	11.0 mg
Phosphorus	6.0 mg	31.0 mg	140.0 mg	476.0 mg
Magnesium	4.8 mg	6.2 mg	15.0 mg	18.0 mg
Potassium	139.0 mg	222.0 mg	370.0 mg	380.0 mg
Iron	.1 mg	.6 mg	3.3 mg	8.8 mg
Zinc	.05 mg	.3 mg	4.4 mg	4.0 mg
Copper	.04 mg	.08 mg	.18 mg	12.0 mg
Vitamin A	None	None	40 IU	53,400 IU
Vitamin D	None	None	Trace	19 IU
Vitamin E	.37 mg	.11 mg	1.7 mg	.63 mg
Vitamin C	7.0 mg	6.0 mg	None	27.0 mg
Thiamin	.03 mg	.05 mg	.05 mg	.26 mg

Riboflavin	.02 mg	.05 mg	.20 mg	4.19 mg
Niacin	.10 mg	.60 mg	4.0 mg	16.5 mg
Pantothenic Acid	.11 mg	.19 mg	.42 mg	8.8 mg
Vitamin B6	.03 mg	.10 mg	.07 mg	.73 mg
Folic Acid	8.0 mcg	24.0 mcg	4.0 mcg	145.0 mcg
Biotin	None	.42 mcg	2.08 mcg	96.0 mcg
Vitamin B12	None	None	1.84 mcg	111.3 mcg

[chart credit](#)

Liver from poultry, fish, cow, pig, lamb and game have been revered as sacred foods for mothers and babies in traditional cultures for hundreds of years. Because of its nutrient density and the need for childbearing women to have adequate nutrition for optimal fertility, building babies, and then supplying the most nutrient rich breast milk, liver is still highly nutritious for all people and part of a healthy diet. Since we can only eat so much, it ought to be nutrient rich. All of the vitamins and minerals, as mentioned previously, contained in liver are important for PCOS women and their reproductive system. (Allbritton) Liver is helpful with weight loss and enhancing muscle growth because of its protein and nutrient density. ("Liver")

Unfortunately, many warn against the consumption of liver for fear of vitamin A toxicity and that liver stores toxins, and would therefore be harmful to consume. Vitamin A toxicity from food sources has been discussed before in the cod liver oil section and that is no longer considered a valid concern against consuming liver. As for the other concern, "one of the roles of the liver is to neutralize toxins (such as drugs, chemical agents and poisons); but the liver does not store toxins. Poisonous compounds that the body cannot neutralize and eliminate are likely to lodge in the fatty tissues and the nervous system. The liver is not a storage organ for toxins, but it *is* a storage organ for many important nutrients (vitamins A, D, E, K, B12 and folic acid, and minerals such as copper and iron)." (Razaitis) But also for this reason, "purchase liver from animals that have enjoyed their lives on chemical-free pasture. The second best choice is organic chicken, beef, or calf liver. The third choice is non-organic calf liver, since these younger animals typically spend the first months of their lives on pasture. The amount of time on pasture varies from ranch to ranch, so do some investigative digging. Avoid livers from conventionally feed-lot raised chickens, hogs or cattle.

As for taste, calf liver is considered the best of the best because of its delicate taste and tenderness. Lamb liver runs a close second and chicken liver is similar in rank because of its lighter flavor and texture. Beef liver is tougher and has a stronger flavor compared to calf liver, but if not overcooked, can still be delicious. Pork liver has the strongest flavor and is best utilized in highly seasoned liverwurst." (Allbritton)

If eating liver once or twice a week is not an option or not appealing, dessicated liver taken in capsules or tablets or powder added to food, is an option to be considered. When choosing a brand of dessicated liver, it is imperative to insure that it does not contain synthetic vitamins. These

have been added to account for the vitamins that have been lost from processing, heating and manufacturing. The Solgar brand has synthetic B12 added. Nature's Life Beef Liver, defatted and dessicated, is processed on machinery that is oiled with cottonseed oil which is a trans fat, mostly likely GMO and laden with pesticides. Radiant Life dessicated liver is from grass fed cattle and does not have any synthetic vitamins or iron added, and is regularly tested to ensure it's purity. Interestingly, all three brands have similar pricing.

Glandular and Protomorphogen Extracts

Glandular extracts are whole organs, often glands but not always, that have been dried at low temperatures, ground up, and then put into capsules. Protomorphogens are like homeopathics in that they promote healing over time. They are composed of nuclear proteins and used to supply a better RNA/DNA template so that the body can assemble available nutrients to repair damaged tissue in the glands being treated. Protomorphogen extracts were first invented by a dentist, Dr. Royal Lee, in the 1940's. "Protomorphology, the study of how protomorphogens work, has determined that protomorphogens are just bundles of enzymes and their activators. Enzymes are the key to growth and repair and to maintaining cell health." (Moffat)

Thomas Cowan, a medical doctor that encourages medicine and lifestyle changes that will promote healing in the body before turning to allopathic medicine, says that the first "medicine" he gives to women with PCOS is glandular extracts. "The first [supplement or medicine] is the protomorphogen extract from Standard Process called Symplex F. This medicine is a mixture of specially processed glandular extracts from the four organs that make up the so-called pituitary axis--the pituitary, thyroid, adrenal glands and the ovaries. It was the insight of Dr. Royal Lee to suggest that it is far more productive to work on the entire system rather than trying to normalize one gland. For we now know that these glands compensate for each other, and that they all get ill as a group. I usually give a dose of 1-2 tablets per day for one whole year to help normalize the function of these important organs." (Cowan)

"In modern medicine, glandular therapy with the use of whole glands began in the late nineteenth century when doctors suggested that their patients eat the animal parts, usually from cows, that corresponded to the weak areas of their own bodies. So people began eating brains, hearts, kidneys, and so on as part of their medical treatment. Even the ancient Greeks and Egyptians used glandular therapy, following their basic premise that "like heals like." Protomorphogens and glandulars are safer than the more potent and specific drugs and hormones and they have fewer side effects.

At a cellular level, we have discovered that cells build and repair themselves by first secreting enzymes and protomorphogens into the fluid outside the cell. A layer of protein then forms using these enzyme and protomorphogen components and the other nutrients that come into the body. A wall is then built outside this protein layer using materials surrounding the cell on the outside of the cell. The internal proteins and enzymes then reproduce themselves using protomorphogen templates." (Moffat)

Symplex F from Standard Process contains bovine ovary protomorphogen (PMG) extract, bovine adrenal PMG extract, bovine pituitary PMG extract, bovine thyroid PMG extract and calcium stearate, cellulose and calcium lactate to keep the tablets together. This combination of

protomorphogens promote proper blood sugar and carbohydrate metabolism and hormone function. (“Symplex F”)

There have been no double-blind studies on the effectiveness of Symplex F for PCOS or any glandular and protomorphogen extract for any disease, because research funding is not monetarily advantageous for inexpensive, natural supplements and medications.

Women with PCOS should consider supplementation with glandular and protomorphogen extracts containing the organs they need to normalize, mainly the pituitary axis containing the pituitary, thyroid, adrenal glands and ovaries. This form of natural medicine which gets to the root of PCOS problems is inexpensive and a healing option for women who choose to reap the benefits.

Chlorella

Chlorella is a single-celled, water-grown algae with extraordinary nutrient density including chlorophyll, all of the B vitamins, vitamin C, vitamin E, beta-carotene, amino acids, magnesium, iron, and trace minerals, plus a unique set of phytonutrients. Chlorella is unique because when it enters the body, it binds with heavy metals and toxins to chelate, detoxify and cleanse the body. (Tohi) It is also an antioxidant and helps to fight free radicals which cause damage, like atherosclerosis, in the body. (“Chlorella”)

Because of its beneficial properties, chlorella has been found to be helpful for regulating hormones, balancing blood pressure and blood sugar, boosting the immune system and promoting tissue growth, healing and repair. Chlorella has been found to be helpful in treating and even reversing cancers, obesity, diabetes, hypoglycemia, arthritis, depression, severe liver damage and liver disorders, hypertension, inflammation, various degenerative diseases, essential fatty deficiencies and mineral deficiencies. (Adams, 6) Elson Haas, a medical doctor and author of Staying Healthy with Nutrition says that “It is possible that the GLA found in spirulina and possibly these other products accounts for some of the positive effects that people experience when using them, including decreased appetite, weight loss, and improved energy levels, especially mental energy. I personally have used all of these products and must say I have experienced a subtle increase in mental clarity and alertness (not like a nervous, caffeine-type stimulation). These algae must subtly stimulate our nervous systems or release certain internal neurochemicals that create this “up” feeling.” (Adams, 6)

The molecular structure of chlorella is built in such a way that the nutrients inside of the cells are not easily absorbed when ingested unless the outer cell walls are broken. Broken cell wall chlorella is readily available but not all chlorella that is sold goes through this process to aid in nutrient absorption. It is important that the chlorella consumed be broken cell wall for nutrient absorption, organic and pollution free, and grown in good water in the sun. Some experts also recommend that chlorella not be consumed in tablets because the glue used to stamp the chlorella together may have questionable ingredients and the high heat required to form the tablets can destroy nutrients. (Tohi and “Chlorella”)

Spirulina and chlorella are both algae but have different health benefits from each other. Both should be researched by each individual woman with PCOS to determine which is best and in what dosage. It is important to consider that anyone first starting to take chlorella, which detoxifies,

may need to start slow. Any detoxification has uncomfortable side effects necessary for toxins to be removed from the body which includes gas, nausea, stomach cramps, diarrhea, and breakouts on the skin. If a particular brand of chlorella recommends 4 tablets, for example, in a serving, it may be beneficial to start with 2 tablets, or whatever is tolerated, for some time. 4 tablets can be a goal to work toward.

From my research, the least expensive quality chlorella in tablet form is available from Mercola.com and is called Organic Broken Cell Wall Chlorella. The least expensive quality chlorella in capsule form is from Premier Research Labs and is called Premier Chlorella.

All PCOS women should consider supplementing with chlorella, because toxins are a potential cause of PCOS pathology and healing from PCOS requires detoxification in addition to lifestyle changes to reduce toxin exposure.

Probiotics

Probiotics are the beneficial bacteria found in fermented food and the isolated bacteria in nutritional supplements that when consumed, propagate the intestinal tract to fight bad bacteria and replace damaged flora. Probiotic literally means “for-life” or “pro-life” where antibiotic means against life.

Foods have been fermented for thousands of years by all traditional cultures. Milk, fruit and vegetables, beans, fish, meats and cereals have all been fermented in the past to be made more digestible and as a form of preservation. Yogurt, kefir, and cheese are a way of fermenting and preserving food. Sauerkraut, fermented cabbage, table olives and pickles, for example, are fermented vegetables. Probiotics that are isolated and added to foods and made into supplements today include the *Lactobacilli* family- *L. acidophilus*, *L. bulgaricus*, *L. rhamnosus*, *L. plantarum*, *L. salivarius*, *L. reuteri*, *L. johnsonii*, *L. casei* and *L. delbrueskii*. The family *bifidobacteria* has thirty different species identified including *B bifidum*, *B. breve*, *B. longum* and *B. infantis*, which are seven times more common in the adult gut than *Lactobacilli* and are responsible for producing antibiotic-like substances which protect the gut from pathogens and synthesising amino acids, proteins, organic acids, Vitamin K, pantothenic acid, all of the vitamin Bs, folic acid, iron and vitamin D. *Saccharomyces boulardii* is a yeast discovered because of its use in treating diarrhea and fighting *Candida albicans*. *Escherichia coli* is often known for its pathogenic nature, but there are many physiological strains of E. coli which inhabits the healthy gut and fulfill many needs in the body by digesting lactose, producing vitamins, amino acids, antibiotic-like substances and fight pathogenic microbes including the pathogenic members of its own family. *Enterococcus faecium* or *Streptococcus faecalis* break down proteins and ferment carbohydrates. The *Bacillus subtilis* family includes *B. licheniformis*, *B. cereus*, *B. brevis*, *B. mesentericus*, *B. pumilis* and is considered especially therapeutic for all autoimmune diseases and allergies, because it produces a host of digestive enzymes, anti-fungal, anti-viral, anti-bacterial, and other beneficial substances. (Campbell-McBride, Gut 245-250)

Damaged gut flora, whether from antibiotics, an unhealthy diet or prescription drugs, has shown to be a potential cause of PCOS. Besides all of the aforementioned beneficial activity of probiotic foods and supplements, probiotic bacteria should also be a priority for PCOS women, because damaged gut flora failing their “jobs” can directly cause PCOS pathology. PCOS women will

benefit from whole probiotic foods in their diet for this reason plus the addition of a therapeutic grade probiotic.

There are many different kinds of probiotics on the market from drinks to powder, capsules and tablets but unfortunately, many do not contain enough probiotic bacteria to actually inhabit the gut flora and do any good in improving the quality of damaged gut flora in an individual. It is important to look for a probiotic with as many different species of beneficial bacteria as possible, preferably with different strains, not only bacteria from the *Lactobacilli* family, for example. It should also be concentrated, at least 8 billion bacterial cells per gram. From my research, Bio-Kult brand fulfills all of these recommendations. Primal Defense probiotic with Homeostatic Soil Organisms by Garden of Life is also recommended. Women should do their own research to find the best quality probiotic that they can afford.

When taking a probiotic, it is important to know that all therapeutic grade probiotics will produce a “die-off” reaction because the introduction of good probiotic bacteria will destroy pathogenic bacteria, viruses, and fungi, and when these microbes die, they release toxins. Die-off symptoms may include nausea, diarrhea, stomach cramps, a feeling of tiredness or just being “off”, and skin rashes. For this reason, it is important to start slow with a very small dose. It is extremely dependant on the quantity of beneficial bacteria and how damaged that person’s gut flora is. An adult should have 15-20 billion bacterial cells per day. If a therapeutic grade probiotic ‘serving’ is four capsules, it may be wise to start with one, or even half of a capsule, observe if there are any die-off symptoms and move up progressively. If there are die-off symptoms, it is vital that the dosage not be increased until the die-off symptoms go away completely. Then, the dosage may be increased and the process continues again until die-off symptoms stop, which could be days or weeks, until the therapeutic grade amount is reached. Once a person is taking a therapeutic amount of probiotics, it should be maintained for six months to properly colonize the gut. This colonization period may need to be longer for some people. Maintenance doses after this time are generally half of the therapeutic grade amount but may be the full amount depending on the individual. Some people will need to supplement with therapeutic grade probiotics depending on the extent of the damage to their gut flora and the lifestyle they are keeping.

There are some concerns the stomach acids kill probiotics and therefore, are absolutely no use, a sugar pill in effect and a waste of money. This is not correct thinking because the stomach benefits from probiotic bacteria and needs it to deal with its pathogens. Also, dead probiotic bacteria does a lot of good no matter where it is by absorbing toxins and removing them from the body, a necessary requirement in the die-off and colonization process. There is concern that the coating on some probiotics specifically to protect it from stomach acids will not break down adequately to release the probiotics and do any good.

In order for probiotics to do any good in the gut, pathogens in the gut cannot be fed processed sugars and carbohydrates. If pathogens are constantly being fed, probiotic bacteria cannot repair the flora, fight pathogens, and “take over” so-to-speak. The probiotic bacteria can only have the advantage if the diet is changed to promote healthy gut flora also. (Campbell-McBride, Gut 25-253)

In conclusion, PCOS women should consider probiotic supplements in addition to probiotic foods to fight PCOS through the gut, with consideration for the kind of probiotic, how much, and the diet that goes with it.

Maca

Maca root is a cruciferous vegetable native to the Andes of Peru and grows in farmland that is rich from volcanic minerals. The Peruvian people have consumed maca in many forms and historically touted its benefits which promote fertility, energy, endurance, vitality and sexual virility. From a scientific standpoint, maca is made up of over 31 different minerals and 60 phytonutrients. It is full of antioxidants and alkaloids and classified as an adaptogen in botanical medicine. (Rodriguez) These properties make maca beneficial for the adrenals, as it increases adrenal function, energy and reduces stress because of its adaptogenic properties. It has also been found to be a hormonal regulator, because it supports the endocrine system and balances hormones. Maca is also an aphrodisiac and fertility aid because of all of its beneficial properties. (Ley)

Dr. Gloria Chacon, a biologist and researcher in Peru, has found that the alkaloids in maca act on the hypothalamus-pituitary axis which explains maca's hormone regulating properties and on the adrenals, thyroid and pancreas as well. (Ley, 13) (Medling) In a study with 34 women, organic, gelatinized maca proved to have beneficial properties including toning of hormonal processes along the Hypothalamus-Pituitary-Ovarian axis, balancing hormone levels and relieving symptoms of menopausal discomfort, (hot flushes and night sweating in particular), and thereby exhibited a distinctive adaptogenic function and proved to be an alternative to hormone replacement therapy for menopausal women. (Meissner, et al) Because of its adaptogenic properties and ability to balance hormones according to the needs of each individual woman, maca is a potential addition to the healing protocol of PCOS women, as it addresses the hormone imbalance of PCOS at its core. Anecdotally, PCOS women have reported menses within 2-6 weeks where there has been none for one to three years and regulation of 28 cycles following. (Medling)

There are many different kinds of maca sold and 13 different phenotypes of maca. Traditionally, maca is not consumed raw but cooked for better digestibility and nutrient absorption. Those who consume raw maca often report stomach upset and the studies that have been done used organic gelatinized maca, not raw. Gelatinized maca has the starch removed for better digestion. (Rodriguez) There are brands on the market which claim to study the phenotypes of maca to find the most suitable phenotype for different conditions, as different phenotypes have different active constituents and effects on the body.

James Frame, the CEO of Natural Health International which sells *Femmenessence*, the brand of gelatinized organic maca that has been studied for its hormone balancing and adaptogenic properties, has reported that *Femmenessence* is specifically formulated for young women through menopause who need help balancing their hormones and is beneficial for women with PCOS. The recommended dose is one capsule in the morning and one in the evening without food, and he says, "recommends when women first start taking Femmenessence to stay on it for four months continually. Then assuming they are in balance after that initial period (if not keep taking it without a break) we recommend a week break. Then a week break every 2-3 months. However, we have had reports of women waiting six months and only taking a five day break as well as some women taking a week off every four months or whatever is right for them. Dosing is also important as many

women may stay on Femmenessence but reduce the dose to one capsule a day, rather than having a break. The reason for this is because intensity, frequency, and duration of stimuli are what affect results and just like a training program, the body can adapt to these stimuli. We avoid any plateau effect by utilizing this break. The healthier a person is, the faster they can adapt. Therefore, those suffering with complex conditions do not need to “change their routine” as often.” (Frame)

No drug interactions have been reported with maca or any side effects except for stomach upset from raw maca, which is not recommended. Maca can be taken in combination with oral contraceptives or Metformin although they may not be required, depending on the reason for their use.

Maca has a long history of use for the very issues that PCOS women face, and thus is considered to be very safe over long periods and very beneficial. Studies are proving the efficacy of maca and companies are producing products that make maca a convenient supplement for PCOS women that may deal with the etiology of PCOS.

Progesterone Cream

For PCOS women, ovulation does not occur when the body is not signaled to produce a progesterone surge. Without the progesterone surge, the egg turns into a corpus luteum but is not released making the body unable to ovulate. This corpus luteum becomes a cyst instead of becoming a released ovum. The hypothalamus detects that there is no progesterone surge or ovulation and produces more FSH and LH which in turn stimulates the production of more androgens and estrogen in order to stimulate more follicles to ovulation. Without adequate progesterone, more cysts are made and the woman’s body becomes dominated by estrogen and androgens. The cause of this abnormality, including obesity, environmental toxins, poor nutrition, etc, has been discussed previously.

Dr. John Lee, M.D. has discovered in his practice that natural progesterone supplementation in physiologic increments of 15 to 20 mg for the last 2 weeks of a woman’s menstrual cycle, in conjunction with good nutrition and lifestyle changes, has resulted in improvement of PCOS symptoms like acne and facial hair and normalizing of women’s hormones. This treatment should continue for at least 6 months to see results and when symptoms fade, women can ease off the progesterone by using half the dose and see what happens. If symptoms persist, women should stay on the full dose for another 6 months and continue in this way until their body has healed and learned what to do without the progesterone supplementation. Some women with very damaged bodies may always need to use progesterone cream in some amount. (Lee, “What”)

Progesterone supplementation is most effective transdermally or when applied topically through cream or oil. Progesterone is fat-soluble, and when put into the stomach by pills or capsules, it is then absorbed and taken directly to the liver where it excreted in the bile. 85-90% of progesterone is lost through the bile or converted to metabolites that are not like real progesterone. In order for the body to get the 20 to 24 milligrams needed, oral doses of 100-200 milligrams must be used. The liver must work hard to get 10 to 15 percent of the oral dose into the bloodstream, which for PCOS women whose livers are already having issues processing hormones, is cause for concern. Conversely, natural progesterone applied to the skin is absorbed and taken

directly into the bloodstream by riding on fatty components such as chylomicrons and red blood cell membranes (Lee, 443) and is nearly 100% biologically available for use by the body. This way, much smaller physiologic doses similar to what the body should produce on its own can be used without the risk of shutting down hormone receptors and their ability to act on their own without supplementation. (Lee, 355)

The kind of progesterone used is of particular importance, because not all progesterone creams are created equal. For starters, not all products labeled “wild yam extract” actually contain progesterone because it may be ground up wild yam, diosgenin (an extract of wild yam) or progesterone. There is only one molecule that is progesterone, and progesterone creams with “wild yam extract” might not actually have any progesterone at all. In addition, it may not list how much progesterone is in the product on the label. (Lee, 361) It is best to use progesterone cream that has 900 to 1,000 mg of progesterone per 2 ounces because creams with 3,000 mg per 2 ounces make it too easy to overdose, and creams with much less progesterone are not as effective or easy to use. It is also important that the progesterone be suspended in the proper medium, as mineral oil or wax may prevent the cream being absorbed into the skin, and other products may not stabilize the progesterone, so exposure to oxygen deteriorates the effectiveness of the cream. Creams that come in a jar should be favored over creams that have a pump style top for this reason. (Lee, 361-362)

There is no evidence of side effects in 99 percent of cases when physiologic amounts of 15 to 20 milligrams of progesterone cream are used. In cases where there are side effects, overdose is almost always the culprit. Using a cream with other hormones, like testosterone and estrogen, mixed in can also cause side effects. Side effects that have been reported include lethargy or sleepiness, edema, bloating, lowered libido, depression, and symptoms of estrogen deficiency. (Lee, 364-366)

Because progesterone is a naturally occurring substance, patents cannot be made by the pharmaceutical industry on progesterone creams making studies on its effectiveness monetarily unproductive for them. There is evidence that progesterone cream has been effective in relieving PCOS symptoms and preventing miscarriage through the experience of women and their doctors all over the world.

Botanical Medicine

Botanical medicine is one part of the diverse medical and health care systems, practices and products that are defined as complementary and alternative medicine (CAM). Today, herbal remedies or botanical medicine fall into the category of biologically based therapies which “refers to substances found in nature, including herbs, foods, and vitamins.” (Romm, 1) It is estimated that 80% of people in developing countries depend on botanical medicine and traditional practitioners, including herbalists, for their primary care. In modern industrial countries, it is estimated that at least 20-30% of people regularly use botanical medicine and for certain conditions such as HIV, cancer, and other chronic diseases, the “numbers have been reportedly been much higher.” (Romm, viii)

For many women with PCOSn conventional medicine fails to improve their health, quality of life and fertility when they choose to conceive. Botanical medicine is an option they are willing,

often enthusiastically, to use. This section's aim is to catalog the herbs commonly recommended for women with PCOS, including their action in the body and the evidence base for their recommendation with traditional, anecdotal and scientific evidence.

Most commonly, herbal protocols for women with PCOS are tailored to their specific needs. No one botanical prescription will be perfect for every PCOS woman. Herbs are combined to create a formula most healing for each woman with her own specific needs. Herbs for symptoms like acne, amenorrhea, dysfunctional uterine bleeding, depression and anxiety should all be added to an herbal formula in addition to the obvious herbs for hormonal regulation, insulin resistance, blood sugar regulation and menstrual irregularities.

A botanical treatment summary for women with PCOS would probably include controlling insulin resistance and hyperlipidemia through dietary changes and herbal adaptogens like eleuthera, licorice, ginseng, rhodiola, schisandra and antihyperlipidemics like Gymnema and Tulsi, treating hormonal dysregulation with herbs such as licorice, peony, tribulus, blue vervain and chaste berry and then herbs added for other symptoms that come with PCOS and its pathology. Generally speaking, herbs take 2-8 weeks to show evidence of healing results and are adjusted through the process of healing depending on the individual.

Sample Botanical Prescriptions

"The first two formulae below are recommended by herbalist Amanda McQuade Crawford in her book *Herbal Remedies for Women* as a biphasic treatment for ovarian cysts. They are slightly modified to fit the dosage strategy used in this textbook.

Formula 1: Menstruation through Ovulation (tincture)

Blue Cohosh (*Caulophyllum thalictroides*) 25 ml

Black Cohosh (*Actaea racemosa*) 20 mL

Yarrow (*Achillea millefolium*) 5 mL

Wild yam (*Dioscorea villosa*) 10 mL

Black haw (*Viburnum prunifolium*) 10 mL

Milk thistle seed (*Silybum marianum*) 20 mL

Total 100 mL Dose: 5 mL three times daily.

Formula 2: Ovulation to the onset of Menstruation (tincture)

Chaste berry (*Vitex agnus-castus*) 30 mL

Black cohosh (*Actaea racemosa*) 30 mL

Dandelion root (*Taraxacum officinale*) 15 mL

Wild yam (*Dioscorea villosa*) 15 mL

Black Haw (*Viburnum prunifolium*) 10 mL

Total 100 mL Dose: 5 mL three times daily

Hormonal Normalizing Formula for PCOS (Tincture)

This formula is designed to have a normalizing effect on the HPO axis, and thereby a regulating effect for women with PCOS.

Chaste berry (*Vitex agnus-castus*) 30 mL

White peony (*Paeonia lactiflora*) 20 mL

Black cohosh (*Actaea racemosa*) 20 mL

Dong quai (*Angelica sinensis*) 20 mL

Hops (*Humulus lupulus*) 10 mL

Total 100 mL Dose: 5 mL three times daily.

For women prone to blood sugar dysregulation, also give 2.5 mL each daily of Gymnema and fennel tinctures.

Case History: PCOS

Sarah, aged 34, thinking about getting pregnant, presented with irregular menses. She was diagnosed with PCOS in the past 2 years. Up until 6 months prior to her naturopathic consultation, she has taken an oral contraceptive in combination with Levoxyll but suffered side effects of heightened emotional lability from these drugs. Her menstrual cycle varied in length from 50 to 70 days and she experienced midabdominal cramping for 24 hours prior to the onset of her menses. The flow was medium to light and lasted 4 to 5 days, was a dark red color, starting with brown spotting for 12 to 18 hours. She has had occasional menstrual clots. Her skin was affected badly from the PCOS and she experienced painful, deep cystic acne on her face, chest and back which was made worse for up to a week before the onset of her menses. She has taken two courses of isotretinoin/racycline for treatment of her acne. Breast tenderness was an uncomfortable premenstrual feature. She had gained 23 pounds over the past 3 years, which she had difficulty losing despite exercise on a regular basis. She had a high carbohydrate diet and craved sugar intensely. She was a shift worker in a high stress and high responsibility occupation; she experienced fatigue daily. She was taking prescription thyroid medication for Hashimoto's thyroiditis, diagnosed 4 years prior, at which time she was also diagnosed as having secondary osteoporosis. Recent evaluation of her spinal density indicated osteopenia; her femoral density indicated osteoporosis; and total hip density indicated severe osteopenia.

Additional Assessment

Hormonal evaluation showed a typical pattern of 2:1 LH to FSH ratio, with elevated testosterone and hyperlipidemia.

Treatment Protocol

Chaste berry (*Vitex agnus-castus*) 12.5 mL

Licorice (*Glycyrrhiza glabra*) 12.5 mL

White Peony (*Paeonia lactiflora*) 20 mL

Gymnema (*Gymnema sylvestre*) 20 mL

Echinacea (*Echinacea* spp.) 10 mL

Schisandra (*Schisandra chinensis*) 20 mL

Total: 100 mL. Dose: 8 mL twice daily.

Additionally:

Tribulus concentrated extract, equivalent fucosterol saponins (protodioscin) 300 to 400 mg per day on days 5 to 14 of the cycle to ensure cyclic regularity.” (Romm, 184-185)

“Rational:

Vitex agnus-castus was indicated for the hormonal imbalance and hyperprolactinemia, often resulting in the symptom of premenstrual breast tenderness. A combination of *Glycyrrhiza glabra* and *Paeonia lactiflora* were included into the formula to mimic the synergy of these plants in TJ-68 to reduce elevated testosterone and induce ovulation. *Gymnema sylvestre* was included in the formula to treat the insulin resistance and hyperlipidemia and assist with reducing associated carbohydrate cravings. *Echinacea* spp. root was an important inclusion for the autoimmune mediated hypothyroid condition. *Echinacea* serves as an immune modulator in this case. *Schisandra chinensis* was included in the formula to provide liver support, in particular to improve the liver's ability to conjugate sex hormones, and assist in reducing the circulating levels of testosterone and estrogen. Tribulus was selected to ensure a healthy follicular phase of the cycle and as an androgen modulator. *Fucus vesiculosus* was indicated for thyroid support as a plant source of iodine and is traditionally recommended by herbalists to assist with weight loss associated with hypothyroidism.” (Hywood and Bone)

“After five months on the herbal protocol, the patient’s cycle regulated to a 32-day length with a consistent 15-day follicular phase and 17-day luteal phase. Problematic symptoms such as mastalgia, acne, and hirsutism diminished significantly during the 5-month program. The lipid profile has improved to within normal ranges with the inclusion of a combined regimen of *Gymnema*, and dietary modification (low carbohydrate diet). She lost a total of 12% body weight in the 5 months. The client became pregnant on her second month of actively trying to conceive.” (Romm, 184-185)

Black Cohosh

Black cohosh, also called black bugbane or black snakeroot, is from the *Ranunculaceae* family and has the most updated botanical name of *Cimicifuga racemosa* where in the past it has been *Actaea racemosa*. The major chemical constituents of black cohosh are triterpene glycosides, aromatic acids, tannins, volatile oils, resin, phytosterols, starch and sucrose. Black cohosh is not the same as blue cohosh and are not medicinally related or interchangeable although both are used for gynecologic and obstetric complaints

Black cohosh is most often used for uterine and ovarian neuralgia, as an antispasmodic for uterine pains, uterine irritability, irritated and congested pelvic conditions, amenorrhea, dysmenorrhea, hysteria, irregular pain and uterine contractions, postpartum hemorrhage, relief of insomnia and morning sickness, relief of spasmodic pain of early labor, maintenance of uterine contractions after birth, neurovegetative menopausal symptoms like hot flashes, reduction of sweating, headache, heart palpitations, anxiety, nervousness, irritability, and depression, musculoskeletal pain, premenstrual migraine, cough and osteoporosis.

The mechanism of action that black cohosh has is not completely understood as studies on the estrogenic activity of black cohosh have been contradictory. Recent studies suggest possible serotonergic effects and dopaminergic mechanism of action. (Romm, 523-525) In a study of 134 patients with unexplained fertility using Clomid, half of the group was given black cohosh and the other half was given ethinyl estradiol. The group that supplemented with black cohosh needed significantly fewer days for follicular maturation, had a thicker endometrium, a higher estradiol concentration and luteal phase progesterone levels and a significantly higher clinical pregnancy rate. (Shahin, et al) Another study showed that black cohosh reduces LH and may be useful in the reduction of androgens when PCOS is present. (Trickey, 355)

No drug or supplement interactions have been reported for black cohosh, and those with risk factors like hepatic toxicity should not use black cohosh. Because of the effects black cohosh has on the uterus, it is not safe to use during pregnancy. It is not recommended for those with cancer or endometriosis. (Romm, 525-527) Symptoms have been reported in individuals taking high doses of black cohosh and include frontal headache, dizziness, perspiration, visual disturbances, constipation, intestinal discomfort, loss of bone mass (leading to osteoporosis), irregular or slow heartbeat, low blood pressure, muscle damage, nausea, and vomiting. ("Black cohosh") The FDA Special Nutrition Adverse Events Monitoring System only reports headaches and elevated blood pressure as side effects potentially caused by black cohosh as a solo agent. (Romm, 525)

The German Commission E approves black cohosh for the treatment of premenstrual discomfort, dysmenorrhea and menopausal complaints. Studies and current literature have only tested the safety of black cohosh in the short term for up to 6 months and for this reason, it is not recommended for use for longer than 6 month durations.

Black cohosh is used clinically as capsules/dried herb, tincture/liquid extract and as a standardized extract called Remifemin which is 1 mg triterpene glycosides per tablet. The German Commission E's prescribed dosage for black cohosh is 40 mg herb daily or equivalent tincture made with 40% to 60% ethanol. Dose recommendations vary from 40 to 200 mg daily to 1 to 3 g daily for the dried root, 0.4 to 2 mL daily of 60% ethanolic extract, and 20 drops twice daily of the fluid extract (1:1).

For women with PCOS who choose to use an herbal protocol to manage the disease, Black Cohosh may be a beneficial addition to their protocol in order to improve fertility, dysmenorrhea, amenorrhea, and ovarian pain and neuralgia. (Romm, 524-526)

Black haw

The herb black haw, also called black haw bark, sweet viburnum, stag bush, and American sloe, is from the Caprifoliaceae family. It is a small shrub or tree common to central and southern North America whose constituents include Coumarins (including scopoletin), bitter glycoside (viburnin), triterpenoid saponins, salicosides, resin, plant acids (including valeric acid), viburnin, tannin, arbutin, and trace volatile oils. (Haughton)

Black haw is considered to be one of the most reliable uterine antispasmodics and tonics, along with cramp bark, by herbalists, midwives and naturopathic physicians. Black haw is most commonly used as a uterotonic and for sedating pain and relieving menstrual disorders like dysmenorrhea and amenorrhea. Studies have demonstrated its effectiveness as a spasmolytic on

the uterine musculature with the scopoletin and aesculetin constituents being responsible. (Romm, 133-134)

There are no known side effects from the use of black haw. There is concern that those with allergies to aspirin may have adverse effects from black haw because of the salicylate constituent in Black haw. Not enough is known about the safety of black haw to determine if it can be used safely while breastfeeding. Black haw is used to stop unproductive contractions during labor and miscarriage, otherwise its safety during pregnancy is not well determined. ("Black Haw side")

Black haw is often used, combined with other sedative herbs and herbs that are hormone regulating and may be beneficial for women with PCOS because of its regulating effects on the uterus.

Blue Cohosh

Blue cohosh, also called Papoose root and squaw root, is from the Berberidaceae family and has the botanical name of *Caulophyllum thalictroides*. The major constituents of blue cohosh include thalictroidone, N-methylcystisine, anagyrine, magnoflorine, sparteine, baptifoline, caulophyllumine and the saponins caulosaponin and caulophyllosaponin. Blue cohosh is native to the eastern and central woodlands of the United States and has been traditionally and historically used as an anticonvulsant, antirheumatic, febrifuge, emetic, sedative and most commonly as a gynecologic aid.

The clinical indications for the use of blue cohosh are as a spasmolytic and emmenagogue, uterine and ovarian tonic, and for the treatment of menstrual disorders including amenorrhea, dysmenorrhea, profuse menstruation and pelvic congestion. (Romm, 528-530) The constituents glycosides, caulosaponin and caulophyllosaponin that blue cohosh are known to contain stimulate the uterus and are thought to be responsible for the action of blue cohosh. (Hywood and Bone) The constituents quinolizidine alkaloids sparteine and N-methylcystisine are oxytocic and consequently, also have effects on the uterus. (Romm, 126)

Blue cohosh use is cautioned against for patients with hypertension, cardiovascular disease and those on hypertensive medications because of its potential vasoconstrictive activities. There are no documented reports of drug interactions with blue cohosh. Blue cohosh is contraindicated during pregnancy. (Romm, 529-530)

The dried herb in capsules, the herb in tinctures and decoctions are all used in clinical preparations. Daily dosages are 0.3 to 3g of dried root or dried root prepared as decoction, and 0.5 to 3 mL of a 1:2 liquid extract or equivalent. (Romm, 529)

Blue cohosh is effective in bringing on menstruation and in combination with other herbs, may be a beneficial addition to an herbal protocol.

Blue Vervain

Blue vervain, commonly called Verbena, is also known as Verbena hastata and officinalis, Verbena, Common Verbena, Common Vervain, Eisenkraut, European Vervain, Herb of Grace, Herb of the Cross, Holy wort, Juno's Tears, Pigeon Weed, Simpler's Joy, Turkey Grass, Swamp Vervain, Mosquito Plant, and Wild Hyssop. The constituents of Blue Vervain include mucilages, bitters,

iridoid glycosides (hastatoside, verbenalin), caffeic acid, and essential oil. All above ground parts of the plant are traditionally used medicinally. (“Blue Vervain Herb Profile.”)

Blue Vervain is a nervine and a favorite of many herbalists who specialize in gynecological care because of its effects on the reproductive system. Blue vervain has shown positive improvements for women with emotional irritability associated with hormonal fluctuations, especially PMS, and the German Commission E states it is useful for irregular menstruation, nervous disorders, exhaustion and complaints of the lower urinary tract. Traditionally, herbalists contribute the actions of blue vervain to its hormonal action stimulating liver function in a sluggish, compromised liver. Or vice versa, blue vervain stimulating liver function which in turn improves hormonal action, metabolism and elimination. (Romm, 182) There is no current scientific evidence to prove the efficacy of Blue Vervain for lack of scientific study.

Blue vervain can stimulate uterine contractions, therefore it is advised to avoid during pregnancy. It has been traditionally suggested for low milk supply; consequently and traditionally it is not avoided during lactation. The scientific community has not tested the effects of Blue Vervain on women and their children while breastfeeding to determine its safety. The medical community recommends “staying on the safe side and avoiding use.” Combination products that include Blue Vervain have been reported to cause side effects including skin rash and digestive upset. Side effects from Blue Vervain alone are not indicated. (“Verbena”)

For PCOS women who find that stress is a factor in their ability to heal from PCOS, Blue Vervain may be the nervine they choose to be best for them in addressing stress and hormone regulation. (Card)

Cinnamon

Cinnamon, whose botanical name is *Cinnamomum verum*, has the phytochemicals alpha-pinene, benzaldehyde, beta-carotene, beta-pinene, borneol, camphor, caryophyllene, cinnamaldehyde, coumarin, cuminaldehyde, eugenol, farnesol, geraniol, limonene, linalool, mannitol, mucilage, 8-cineole, phellandrene, tannin, terpinolene, and vanillin. It also has the nutrients calcium, chromium, copper, iodine, iron, manganese, phosphorus, potassium, zinc, and vitamins A, B1, B2, B3, and C. (Balch, 108)

Cinnamon relieves nausea and diarrhea, counteracts congestion, aids peripheral congestion, warms the body and enhances digestion, fights fungal infection, helps with diabetes, weight loss and uterine hemorrhaging. (Balch, 108)

One study showed that taking 1 to 2 teaspoons of cinnamon per day in capsule form lowered blood sugar, triglycerides and cholesterol. Other investigators showed that taking 1-6 grams of cinnamon per day reduced serum glucose, triglycerides and LDL cholesterol in diabetics. (Balch, 377) A 2007 study in *Fertility and Sterility* showed that women with PCOS who were given cinnamon showed significant reduction in insulin resistance compared to the placebo group. (Wang, J.G. et al)

Cinnamon should not be used in large amounts during pregnancy (Balch, 108). Beyond as a cooking spice in foods and ingesting large amounts over an extended period of time, it is not recommended because of the potential toxic buildup of certain cinnamon compounds. (Balch, 377)

Those with ulcers or those who are on blood thinning medications should not take cinnamon in large amounts. (Barton)

A common dosage of cinnamon is 1 teaspoon dried bark powder per day or 2-4 mL or 45-115 drops tincture per day in water. (Barton)

Cinnamon may be a beneficial addition to an herbal protocol for women whose underlying PCOS pathology is insulin resistance.

Dandelion Root

Dandelion Root has the common names of blow ball, cankerwort, lion's tooth, and wild endive and the botanical name of *Taraxacum officinale*. The constituents of dandelion root include essential oil triterpenes, taraxol, amyrrin, taraxacin, fatty acids myristic, palmitic, stearic and lauric, carotenoids, pseudotannins, caffeic acid, saponins, sitosterol, bitter flavonoids, pectin and insulin.

Dandelion's medicinal properties include diuretic, laxative, antispasmodic, bacteriostatic, fungistatic, and diaphoretic actions. The bitter flavonoids provide the diuretic, antispasmodic and anti-inflammatory properties. Dandelion is a mucilaginous herb, as it contains pectin and insulin. These properties soothe the digestive tract, absorb toxins from ingested food, keep in check bad bacteria which produce toxins and kill good bacteria and help friendly flora thrive. The mucilage does this by absorbing bad bacteria, thereby allowing the body to heal itself by removing a sort of pollution. Dandelion also stimulates organs to produce mucous which prompts the organs to rid themselves of toxins directly. The fascinating thing about dandelion is that it has such a balanced mineral profile and high Vitamin A count which helps balance the diuretic effect of the herb and replace the Vitamin A stores in the liver that are purged when the liver releases toxins out of the body. (Pedersen, 78-79)

For those allergic to ragweed and related plants, dandelion root may also prove to be a problem. No other side effects are noted. There have not been enough studies on the safety of dandelion root in pregnancy and breastfeeding to prove its safety. ("Dandelion")

Typical daily usage of dandelion root is ¼ to ½ cup fresh root, 6 to 12 gm dried root, or a 9 gm dried root, 45 mL alcohol, 45 mL water tincture extract. (Pedersen, 79)

Dandelion root is often combined with alfalfa or licorice. Together, dandelion and licorice is a hypoglycemic formula and is used to balance the metabolic rate and minimize blood sugar changes by enhancing the function of the adrenal glands, pancreas, liver and digestive system. (Pedersen, 241) Alfalfa and dandelion combination is a nutritive formula that improves digestive and nutrient absorption by assisting the detoxification and elimination functions, increasing the production of digestive fluids, enzymes, bile, and blood circulation. This combination is helpful for many diseases and conditions including obesity. (Pedersen, 260)

Because of its detoxification properties on the body and especially the liver, dandelion root may be a beneficial herb for PCOS women in their herbal protocol. For those that discover toxic build-up in the liver which is inhibiting hormone balance and healing from PCOS, dandelion root may be especially helpful.

Dong Quai

Dong quai has the botanical name of *Angelica sinensis* and is also commonly called Dang quai, Tang kuei and Angelica. Dong quai is one of the oldest and most respected herbs in the Chinese pharmacopoeia and is consequently a very popular in Traditional Chinese Medicine. The constituents of Dong quai include alkylphthalides, ferulic acid, essential oils, amino acids, lipids, aromatic compounds, polysaccharides, monoterpenes, diterpenes, Vitamins A, B1, B12, E, biotin, nicotinic acid and many trace minerals in the root.

Dong quai is anti-inflammatory, analgesic and antispasmodic for the treatment of dysmenorrhea and endometriosis and is used to “nourish the blood and qi” and restore the state of well being for those with amenorrhea and uterine complaints. Herbalists consider dong quai to be a “uterine tonic” based on its traditional use and studies which show both relaxing and stimulating activity on uterine tissue. Studies have also shown its ability to relax or coordinate uterine contractions depending on uterine tone. (Romm, 126) It is also thought to improve blood flow in the pelvis and therefore relieve pelvic pain and uterine fibroids. The spasmolytic effects on the uterus and other smooth muscle is thought to be from the volatile components and the excitatory effect from the nonvolatile components. The spasmolytic effects may also be from histamine receptor blocking activity and calcium channel effects of the phthalides, but this has not been fully proven. (Romm, 534-535) Dong quai does seem to have a weak estrogenic effect. (Pedersen, 82)

Dong quai is contraindicated in pregnancy. There is not enough information to conclude whether dong quai is safe to use while breastfeeding. Some people have experienced skin reactions when consuming Dong quai in large amounts. (“Dong quai”) Dong quai has a high level of safety in the general literature. Side effects reported have all been reversible with the discontinuation of use and include worsening of endometriosis, bleeding gums with prolonged use, increased and sometimes excessive menstrual flow, breast tenderness, headaches, and irritability. The herb is contraindicated prior to surgery, generally 2 weeks, because of the increased bleeding and decreased platelet aggregation seen with the herb’s use. The herb is also contraindicated for use when anti-coagulant medical therapy is also being used. (Romm, 535)

The root is used medicinally whether dried and put into capsules or pill form, boiled into decoctions or made into a tincture or standardized extract. The general dosage is 3.5 to 4 g/day dried root, 6 to 12 g/day of the dried root in decoction form, 3 to 5 mL three times per day in tincture form and 200 mg three times per day of standardized extract. (Romm, 535) Some herbalists recommend discontinuing the use of dong quai during menstruation for its ability to increase menstrual bleeding and period frequency. (Romm, 126) According to Naturopathic Doctor and Research Chemist, Mark Pedersen, dong quai works better with a little black cohosh and black cohosh works better with a little dong quai. Conventional science has not yet explained this. When dong quai predominates in this combination, dysmenorrhea is relieved and menstrual flow increases. When black cohosh predominates in this combination, menstrual flow and swelling decreases. (Pedersen, 82) Dong quai and Peony is a traditional blood tonic combination which is used to overcome blood deficiencies, hormone imbalances, dysmenorrhea, infertility and especially when these diseases occur specifically from chronic liver dysfunction. This herb combination works by providing antioxidants, enhancing immune response, improving blood circulation, calming the nerves, relieving muscle spasms and increasing the flow of urine and menstruation. (Pedersen, 245)

For women with PCOS, dong quai may be a beneficial addition to their herbal protocol especially in combination with other herbs.

Ginseng

Asian and American Ginseng have the botanical names of *Panax ginseng* and *Panax quinquefolius*. *Eleutherococcus senticosus* has the common name of Siberian ginseng but is not, in fact, ginseng. (Romm, 204) Asian ginseng will be addressed here as it is the most commonly used and has been the most researched. Other common names of *Panax ginseng* are five finger root, sang, ninsin, panax, pannag, and red berry. (Pedersen, 128) The constituents of *Panax ginseng* include essential oils, panacene, triterpenoid saponins, ginsenosides, panaxosides, polysaccharides, and gum. (Hoffmann, 570) (Pedersen, 129)

Panax ginseng has adaptogen, tonic, stimulant, and hypoglycemic actions. (Hoffmann, 570) Adaptogens are non-toxic substances that increase the body's resistance to adverse effects from physical, chemical and biological factors. (Pedersen, 129) The tonic and adaptogenic actions of ginseng have the ability to enhance nonspecific immunity, inhibit fatigue and have anti-aging effects. Studies have shown that ginseng significantly improves quality of life including well-being when under stress, and improves alertness, relaxation, appetite, fatigue levels, sleep quality, recovery from the common cold and bronchitis, and significantly decreased systolic blood pressure when compared with controls. Ginseng's adaptogenic effects are noted in the HPA axis (Romm, 182) and its hypoglycemic actions regulate blood sugar. (Pedersen, 129)

Studies show conflicting evidence on what *Panax ginseng* does in the body because of its balancing effect. Some studies show hypoglycemic effects and others hyperglycemic and still others, that it does nothing to the blood sugar. This is because it balances the specific person where needed and does not have the same biochemical action in all people. This is the beauty of adaptogens. Adaptogens only work in response to stress, and those who are not stressed will not show results in studies. (Pedersen, 129)

No side effects or drug interactions have been reported with *Panax ginseng*. (Hoffmann, 570)

Panax ginseng is often taken medicinally freshly chewed, dried in capsules, as a tea, decoction, or tincture. Common dosages are 1 teaspoon to one cup water simmered ten minutes as a decoction, three times per day; as a tincture, 1 to 2 mL three times a day (1:5 in 60%) or 1 to 2 mg root daily in capsules or an equivalent preparation. (Hoffmann, 570)

Panax ginseng is commonly combined with eleuthera and ashwagandha as an adaptogenic formula to improve resistance of stress by regulating the HPA axis at the adrenal level. (Romm, 182) (Pedersen, 249) *Panax ginseng* is also well combined with Pollen to make a formula that increases endurance and stamina and relieves tension. Pollen and ginseng combination has traditionally treated fatigue, depression, dysmenorrhea and sexual dysfunction. (Pedersen, 288)

Panax ginseng is a welcome addition to the herbal protocol of most PCOS women, as often having PCOS raises cortisol and stress levels resulting further disruption, if not beginning disruption, of the HPA axis and thus hormones and metabolism.

Gymnema

Gymnema, which has the botanical name of *Gymnema sylvestre*, is a traditional Indian Ayurvedic herb used as an anti-diabetic, hypoglycemic, lipid-lowering agent that promotes weight loss. The leaf is the part used medicinally. The constituents of Gymnema include saponins and gymnemic acids. Gymnema's pharmacodynamic action includes the inhibition of glucose absorption in the intestine by the saponin action in the herb, a trophorestorative action of the beta cells on the pancreas, and its insulin-modulating activity with the added benefit of reducing elevated triglycerides.

The key constituents of Gymnema specifically suppress sweet taste buds for 90 minutes after administration. This is a benefit for those desiring to reduce sugar and sweet food uptake, because it masks sweet detection and reduces desire for sweet foods. Gymnema is indicated for PCOS women because of its ability to regulate insulin activity and inhibit glucose absorption. "Gymnema has demonstrated hypoglycemic activity in experimental models of diabetes and regulated blood sugar in hyperglycemia." (Romm, 182)(Hywood and Bone)

Gymnema does interact with blood sugar and those with diabetes should monitor their blood sugar to watch for the effects Gymnema has. Gymnema also interacts with insulin and medications for diabetes. These pharmaceuticals with Gymnema may cause blood sugar to go too low. Other side effects are not indicated. ("Gymnema")

"The daily dose of Gymnema is 3.5 to 11 mL of 1:1 liquid extract.^{9,14} Since conventional medical models are focusing on pharmaceutical agents such as metformin to control PCOS, Gymnema may prove to be one of the most significant herbs in the treatment of the underlying factor of insulin resistance." (Hywood and Bone)

Hops

Hops has the botanical name of *Humulus lupulus* and other names including Asperge Sauvage, Common Hops, Couleuvrée, Couleuvrée Septentrionale, European Hops, Hop, Hop Strobile, Hopfenzapfen, Houblon, Humulus lupulus, Lupuli Strobulus, Lupulin, Lúpulo, Pi Jiu Hua, Salsepareille Indigène, and Vigne du Nord. ("Hops") Chemical constituents of hops include volatile oils humulene, B-caryophyllene, myrcene, farnesene, flavonoids including glycosides, kaempferol and quercetin, oleoresin, humulone, lupulene, estrogenic substances of undetermined structure, tannins, lipids and xanthohumol. (Hoffmann, 557) Nutrients contained in hops includes amino acids, calcium, choline, chromium, essential fatty acids, iron, magnesium, manganese, phosphorus, potassium, selenium, silicon, zinc, vitamins B1, B2, B3 and C. (Balch, 115)

Hops has sedative, hypnotic, antimicrobial, antispasmodic, astringent (Hoffmann, 557) and estrogenic properties (Buhner, Testosterone 87-88). Often used for the treatment of insomnia, headaches, restlessness, tension and anxiety, hops has a marked relaxing effect on the nervous system. (Hoffmann, 557) Hops also has anywhere from thirty thousand to three hundred thousand IUs of estrogens per 100 grams depending on the hops. Because of the estradiol content, hops can lower testosterone levels and increase SHBG levels which binds with free testosterone in the bloodstream. (Buhner, Testosterone 87-88)

Hops should not be used in patients with marked depression, as the sedative effects may worsen the condition. Hops may interact with medications and alcohol and should not be taken before surgery or while pregnant or breastfeeding. (“Hops”) The suggested dosage and preparation of hops is 1 to 4 mL three times daily of 1:5 in 40% tincture, or an infusion of 1 teaspoon dried herb to 1cup boiling water infused for 10 to 15 minutes drunk at night to induce sleep, or 0.5 g dried herb as a daily dose. (Hoffmann, 557)

Hops may be a beneficial addition to an herbal protocol for PCOS women when testosterone levels are high, and estrogen levels would not be an issue if raised from the use of hops.

Milk Thistle Seed

Milk thistle has the botanical name of *Silybum marianum* and the common names of emetic root, snake milk and milk ipecac. (Pedersen, 123) Milk thistle derives its name from the milky sap that comes out of the stems and leaves and prickly leaves common in thistle plants. (Pedersen, 123) Milk thistle’s chemical constituents include flavolignans, oleic acid, palmitic acid, sterols including cholesterol, ampesterol, stigmasterol, and sitosterol, mucilage and silymarin which is composed of silybin, silydianin, and silychristin. (Hoffmann, 584)

Milk thistle has hepatic, galactagogue, demulcent, cholagogue and antihepatotoxic action. (Hoffmann, 584) It is also has antioxidant properties from the constituent silymarin. The constituents and action of milk thistle lend it to have its traditional reputation as a liver tonic and help with milk supply for breastfeeding mothers. Milk thistle protects the liver from free radical damage by inhibiting the production of the enzymes, leucotrienes and prostaglandins responsible for damaging the liver. For this reason, milk thistle is a treatment for cirrosis, chronic hepatitis, fatty liver deposits, inflammatory skin conditions and jaundice. It can restore liver function impaired by disease or from toxins including ethanol, mushroom toxins, solvents, acetaminophen and psychotropic medications. Milk thistle also has the ability to regenerate liver cells by stimulating protein synthesis resulting in an increase in the rate by which new liver cells are produced to replace old damaged cells. Amazingly, this ability to increase cell growth does not apply to malignant liver tissue. Milk thistle prevents, enhances and restores liver function. (Pedersen, 123) (Hoffmann, 584)

Studies have routinely proven milk thistle’s actions and thus, benefits. In one study with 15 patients taking hepatotoxic psychotropic medications, the patients were given 400 mg dose of milk thistle seed extract twice daily. The milk thistle protected the liver from the medications given simultaneously. (Hoffmann, 584)

No side effects or drug interactions have been reported regarding milk thistle. The common recommended dosage is 175 mg a day of 30:1 seed extract standardized to 80% silymarin or for therapeutic and restorative effects, up to 600 mg per day of the same standardized extract. (Hoffmann, 584)

For those who are having trouble regulating their hormones because of past or present liver damage, milk thistle may be a beneficial addition to a PCOS woman’s herbal protocol.

Peony and Licorice

Peony and licorice is a traditional Chinese combination known as Shakuyaku-Kanzo-To. White peony, also called *Paeonia lactiflora*, is a hormonal regulator that has been shown to positively influence low progesterone, reduce elevated androgens including testosterone, and modulate estrogen and prolactin. The active constituent in *Paeonia lactiflora* seems to be paeoniflorin, a monoterpene glycoside which is thought to act directly on the ovary to reduce the production of androgens in a dose-dependant manner. Paeoniflorin also increases the activity of aromatase enzymes which promotes the synthesis of estradiol from testosterone. Aromatase is also necessary for follicle maturation, ovulation, corpus luteum function, steroid hormone synthesis, and the regulation of conversion of androgens to estrogens. In addition, the feedback mechanisms of the pituitary and hypothalamus rely on aromatase to regulate prolactin and gonadotropin-releasing hormone. It is thought that *Paeonia lactiflora* improves progesterone levels by normalising ovarian function when the activity of aromatase is inhibited. (Romm, 183) (Trickey, 357-358)

Licorice, also called *Glycyrrhiza glabra*, is an adaptogen with many beneficial properties including its ability to reduce testosterone produced by the ovaries and a possible role in the treatment of hirsutism. Together licorice and peony have the unique abilities to reduce testosterone levels and improve estradiol to testosterone ratios after four weeks of administration. It has also been proposed that this formula acts on the ovary first by promoting the activity of aromatase enzyme leading to a greater synthesis of estradiol from testosterone, and improved pregnancy rates. Peony and licorice combination stimulates pituitary dopamine receptors which might be responsible for the improving LH to FSH ratio and a significantly lower LH to FSH ratio. (Trickey, 358)

In a study consisting of eight women with hyperandrogenism and oligomenorrhea, the peony licorice combination was given for 2 to 8 weeks. The result was regulation of LH to FSH ratios, lowered serum testosterone levels and seven of the eight women began to regularly ovulate. In another study with twenty women diagnosed with PCOS, this combination resulted in lowering testosterone in 90% of the women and 25% conceived. (Yaginuma) (Romm, 183)

Thomas Cowan, a medical doctor, recommends the usage of this combination and writes, "the therapy that I use for PCOS is a 50/50 mixture of the herbal extracts of Peony lactiflora and Glycyrrhiza uralensis (commonly known as licorice). There have been three studies in the literature showing that this combination of herbs can result in a complete remission in PCOS, and that it does so by normalizing adrenal function and reducing testosterone levels. It is important to use the correct dosages, which were also indicated in these studies.* I use the Mediherb extracts and give them at a dose of 1/2 to 1 teaspoon of the mixture, 2-3 times per day.

I usually use this mixture for six months with breaks of a week or two every 4-6 weeks.

It is instructive to see our plant medicines not only as plant "drugs," but also as metaphors for the condition we are trying to treat. If what has been said about the dietary causes of PCOS are correct, then one could say that PCOS and many other hormonal diseases, as well as disease of the adrenal gland, could rightly be called the "sweet" diseases. That is, they are all ultimately linked to excessive consumption of carbohydrates, especially the refined carbohydrates that have become the staple foods of the Western diet.

This, as I have shown, results in excess insulin production, weight gain, stress on the ovary and eventual hormonal imbalances.

What we need as therapy for this constellation is sweetness--but without the sugar--sweetness that is more like true love or compassion than the superficial sweetness of eating a sugary dessert. If we combine this with a tonic for the adrenal gland, we would have our true medicine for PCOS. Licorice is just such a medicine. It is virtually the sweetest substance known to humankind, but it has the sweet effect without providing any sugar--it is a carbohydrate-free sweetener. In addition, it contains chemicals called saponins which the adrenal gland can easily turn into the cortisone-like chemicals that do so much to regulate our physiology.

Licorice is the exact picture or metaphor in nature for what we need to do to heal this illness: substitute sugar for a kind of sweetness that is healing, not destructive. I would suggest that this is why in many traditional systems of medicine, such as Chinese medicine, licorice was called the "universal healer," or the "medicine that brings about harmony." It is the medicine of deep sweetness and compassion, not the superficial sweetness of a high-sugar diet." (Cowan)

The licorice and peony combination in the studies mentioned which are the same ones Dr. Cowan refers to used equal amounts of each herb. The dose used in trials was 7.5 g of dried herb daily, in a divided dose. Equivalent fluid extract, which Dr. Cowan uses, is 3 ml daily of 1:1 fluid extract of *Glycyrrhiza glabra*, and 7 ml 1:2 fluid extract of *Paeonia lactiflora* daily. (Trickey, 358)

Stephen Buhner, an acclaimed herbalist and expert in the field of botanical medicine states that, "overdoses or long use of large doses can cause severe potassium depletion (hypokalemia), hypertension, decrease in plasma renin, and aldosterone levels, and at very large doses decreased body and thymus weight and blood cell counts. Because of the estrogenic activity of licorice, it will also cause breast growth in men, especially when combined with other estrogenic herbs. Luckily, all these conditions tend to abate within 2 to 4 weeks after licorice intake ceases. Caution should be used, however, in length and strength of dosage. Contraindicated in hypertension, hypokalemia, pregnancy, and hypernatremia, and in persons taking estrogen therapy or corticosteroids." Daniel Mowrey, also an herbalist and author, and Buhner both agree that side effects from licorice have only been documented with licorice extracts and tinctures and do not exist when the licorice is consumed in its whole form (i.e., the ground root) taken in capsules. (Buhner, 55) The trials mentioned with the peony and licorice combination did not show any side effects.

Red Raspberry Leaf

Red raspberry leaf has the botanical name of *Rubus idaeus* and is also commonly called American raspberry and wild red raspberry. (Pedersen, 145) Its chemical constituents include flavonoids like glycosides of kaempferol and quercetin, tannins, fruit sugar, volatile oil, pectin, citric acid, malic acid, (Hoffmann, 578) alpha-carotene, benzaldehyde, beta-carotene, beta-ionone, caffeic acid, ellagic acid, geraniol, lutein, and has statistically significant amounts of the following nutrients: calcium, iron, magnesium, manganese, phosphorus, potassium, selenium, silicon, zinc, vitamin B1, B2, B3, C and E. (Balch, 124)

Red raspberry leaf has astringent, tonic, parturient, (Hoffmann, 578) antispasmodic and stimulant actions. (Pedersen, 145) For an unknown reason, red raspberry leaf has a particular

affinity for the uterus. Because of this, the relaxant and astringent action of red raspberry leaf brings about a toning, strengthening, nourishing and relaxing effect on the smooth muscle of the uterus. (Hoffman, 393, 509) Red raspberry leaf relieves excessive menstrual bleeding, (Pedersen, 145) relaxes uterine and intestinal spasms, strengthens the uterine wall, (Balch, 124) strengthens contractions during labor, prevents postpartum hemorrhage (Hoffmann, 578) and prevents miscarriage. (Hoffmann, 393)

A study on the use of red raspberry leaf in the United States indicated that approximately 63% of midwives used it to stimulate labor. Two other studies indicated that red raspberry leaf can be consumed during pregnancy with no side effects for the mother or baby. These studies also showed that the consumption of red raspberry leaf in pregnancy may improve labor outcomes and reduce the rate of medical intervention at birth, including a lower rate of forcep deliveries, amniotomy, cesarean section and vacuum extraction. (Romm, 405)

There are no reported side effects from consuming red raspberry leaf tea. Herbalists recommend red raspberry leaf tea be taken in the form of an infusion, 1 to 3 cups daily. (Romm, 405)

For PCOS women who experience excessive bleeding at the time of menstruation due to delayed and irregular cycles or another cause, red raspberry leaf tea may prove helpful.

Saw Palmetto

The herb Saw Palmetto, whose botanical name is *Serenoa repens*, has both nutritional and medicinal properties. It grows in the southeastern portion of the United States and the fruit or berries of the plant are the part used clinically as medicine. The chemical constituents of saw palmetto include volatile oils, resin, saponins, sitosterols, mucilaginous compounds, pectin and unidentified compounds with antiandrogenic activity. Saw palmetto is very high in phosphorus and zinc.

Saw palmetto has antiandrogenic, diuretic, urinary antiseptic and potentially aphrodisiac action. (Pedersen, 153) Studies have shown that saw palmetto is anti-androgenic and effective in the treatment of benign prostatic hypertrophy and hirsutism because of its ability to inhibit conversion of testosterone to DHT and the action of 17-hydroxysteroid dehydrogenase on androstenedione. It is most likely that the anti-androgenic action of the herb is from the inhibition of androgen receptor site binding. (Trickey, 353)

Mild side effects may occur with saw palmetto including headache, dizziness, constipation, diarrhea, nausea, and vomiting. There is some concern that saw palmetto may cause damage to the liver or pancreas but this has not been substantiated or proven. Saw palmetto is not recommended during pregnancy or while breastfeeding because of its hormonal activity and may interfere with blood clotting, so it should not be taken prior to surgery. Again, because of the hormonal activity of saw palmetto, it may interfere with certain medications, yielding them ineffective, including oral contraceptives, estrogens and anticoagulant and antiplatelet drugs. ("Saw Palmetto")

The typical clinical dosage is 2-3 teaspoons fresh berries, 1-1.5 gm dried berries, or 1.5 gm dried berry, 8 ml alcohol and 7 ml water extract daily. (Pedersen, 153)

Saw palmetto may be a beneficial medicinal herb for PCOS women because of its anti-androgenic activity and the fact that excess androgens is a cyclic cause of PCOS etiology and symptoms.

Tribulus

Tribulus, also known as *Tribulus terrestris*, Puncture Vine, Caltrop, Yellow Vine, Goat Head, Devil's Thorn, Devil's Weed, Tackweed, Ground Caltrop, Mexican Sand-burr, Bullhead, Cats Head, Texas Sand-burr, and Gokshura, ("Tribulus Fruit") is an epidemic weed in many parts of the world, including "the Mediterranean, India, China, South Africa and Australia and is most commonly known as Puncture vine. The aerial parts, particularly the leaf, are used for medicinal purposes in the Western tradition." (Hywood and Bone) Constituents of Tribulus include, "saponins (protodioscin, furostanol), glycosides, flavonoids, alkaloids, resins, tannins, sugars, sterols, essential oils, Terrestrinins A and B, and protodioscin." ("Tribulus Fruit")

Because of recent research in Bulgaria, Tribulus has become a popular herb for female and male endocrine disorders and is now considered to be a general tonic, aphrodisiac, estrogen and androgenic modulator, and is used to restore vitality, libido, and reduce the physiologic effects of stress.

"The Prodioscin, a steroidal saponin in Tribulus, has been proven to improve sexual desire via the conversion of protodioscine to DHEA (dehydroepiandrosterone)." (Romm, 183-184)

"The Bulgarian research has identified a unique steroidal saponin class known as furostanol saponins, and extracts are standardized to contain at least 45% of these saponins, calculated as protodioscin. The leaf is noted to be higher in these unique saponins rather than the fruit or root. Other active constituents include phytosterols and spirostanol glycosides.

The tonic activities of Tribulus have been shown to act by intensifying protein synthesis and enhancing the activity of enzymes associated with energy metabolism. It increased iron absorption from the small intestines and inhibited lipid peroxidation during stress. This leads to more muscle strength and improved endurance and stamina.

To ensure the desired clinical results, it is recommended to use only the Bulgarian -rown Tribulus standardized to 40% furostanol saponins. It is not interchangeable with the Chinese or Indian Tribulus. The daily dose of Tribulus corresponds to extracts containing furostanol saponins as protodioscin at 300 mg to 400 mg per day. In PCOS it is best used on days 5 to 14 of the menstrual cycle to restore menstrual regularity." (Hywood and Bone)

Tribulus does not appear to increase testosterone but only regulate hormones in humans. "Women use tribulus to tone muscles before childbirth, to cause an abortion, and to stimulate milk flow." "Tribulus supplements are possibly safe for most people when taken by mouth for a short period of time. They have been used safely in research studies lasting up to 8 weeks. The long-term safety of tribulus is unknown. Don't eat the spine-covered fruit. There has been a report of a serious lung problem linked to eating the fruit. Taking tribulus during pregnancy is possibly unsafe. Animal research suggests tribulus might harm fetal development. Not enough is known about the safety of using tribulus during breast-feeding. It's best not to use tribulus if you are pregnant or nursing. There is a concern that tribulus might make prostate conditions such as benign prostate

hypertrophy (BPH) or prostate cancer worse. Developing research suggests that tribulus can increase prostate weight. Tribulus might affect blood sugar levels. This might interfere with blood sugar control during and after surgery. Stop using tribulus at least 2 weeks before a scheduled surgery.” (“Tribulus”)

In conclusion, Tribulus may be beneficial for women with PCOS because of its hormone regulating activity and the fact that its side effects are not likely to apply to women with PCOS. It would therefore have more benefits and be more likely to help or else have no effect at all.

Tulsi

Tulsi, also called Holy Basil and Tulasi, has the botanical name of *Ocimum sanctum*. Highly regarded for its healing abilities in India, tulsi has the chemical constituents eugenol, B-caryophyllene, sesquiterpenes, monoterpenes, ascorbic acid (vitamin C), carotene (vitamin A), calcium, iron, and selenium, as well as zinc, manganese, and sodium as trace elements. (“Holy Basil”)

Tulsi has hypoglycemic, hypolipidemic, immunomodulatory, adaptogenic, analgesic, antipyretic, anti-inflammatory, anti-ulcerogenic, antihypertensive, CNS depressant, radioprotective, anti-humour, and antibacterial actions. (Kumar Das and Vasudevan) Studies have proven these actions. Recently, a study also proved that tulsi is anti-androgenic. (Sethi, et al)

Tulsi is not recommended during pregnancy or lactation. Because of its action, those taking medications for diabetes, hyperglycemia and similar conditions should be cautioned when using tulsi as their medication will probably need to be adjusted. Tulsi can be prepared and taken orally as a tea, dried, fresh leaf or as a tincture. (“Holy Basil”)

Tulsi is recommended for women with PCOS because its actions directly address the underlying pathology of PCOS. For some women, tulsi may be the only herb they choose to take or will be a good addition to an herbal protocol.

Vitex Agnus-Castus

Vitex agnus-castus, also called chaste tree, chasteberry, monk’s pepper, and vitex, is from the verbenaceae family. The Vitex fruit is the part of the plant used medicinally. Compounds of Vitex include alkaloids, flavonoids and compounds that are precursors to steroidal hormones. No single component of Vitex is responsible for the herbs’ activity. It is more likely that the compounds acting together bring about the herb’s action.

The pharmacodynamics of Vitex are not yet entirely understood, but it is known that Vitex does have dopaminergic activity, meaning it binds with dopamine receptors in the pituitary, influencing hormone secretion from the pituitary gland. Consequently, Vitex has FSH-lowering effects and increases luteinizing hormone which promotes progesterone. Pharmacological studies indicate that Vitex is indirectly progestogenic and may be beneficial in conditions where there is unopposed estrogen, like PCOS. There is also evidence of efficacy for corpus luteum insufficiency and infertility associated with corpus luteum insufficiency.

Numerous studies and clinical trials have shown that women with menstrual disturbances and PMS benefit from Vitex. Symptoms like headaches, breast tenderness, bloating, anxiety and mood swings have been alleviated. (Carmichael) (Berger, et al)

In addition to PMS, amenorrhea and dysmenorrhea, other indications for Vitex are acne, insomnia, depression, low libido, infertility, and ovarian cysts. Because of its positive effect on p

Progesterone levels, Vitex is also indicated for habitual miscarriage due to low progesterone levels. (Romm, 531)

Herbalists report that Vitex has been successful in removing ovarian cysts because of its effects on high FSH and estrogen levels, but it has also caused ovarian cysts to form. The etiology is higher levels of progesterone can accelerate the formation of the corpus luteum to such a degree that the ovum is trapped in the ovary, forming a cyst. (Wood, 523-526) Other herbalists have specifically experienced the effects vitex has on cell growth and report that fibroids and ovarian cysts, if already present, can grow exponentially. For this reason, when abnormal cell growth like ovarian cysts is already present, *Vitex agnus castus* is not recommended by some experienced herbalists. (Oshel)

Side effects of *Vitex* are rare but can include gastrointestinal disturbance/nausea, acne, skin reactions, intermenstrual bleeding, headache and depression for those with a history. No drug-herb interactions have been reported, and all adverse reactions have been shown to be mild and reversible except for consequences from abnormal cell growth from the use of *Vitex*. (Daniele, et al) (Foster and Johnson, 98-99) (Romm, 182, 531-533) (Wood, 523-526) *Vitex* is a class 1 herb according to the Botanical Safety Handbook and has not been studied extensively enough to produce proof that it is safe to use throughout pregnancy. Although in a study using female rats, up to 80 times the concentration used clinically in humans showed no difference in offspring compared with controls, and no teratogenicity was seen in the offspring of rabbits given up to 74 times the recommended dose for humans. Historically and traditionally, *Vitex* has been used to increase milk supply in breastfeeding mothers. Interestingly, studies have shown the opposite effects with vitex lowering prolactin levels. It is thought the effects may be dose dependent.

Vitex is used clinically in tablet, capsule and tincture form. There is a wide range of dose recommendations in the herbal and scientific literature from 30 to 40 mg of power daily to 500 to 1000 mg daily. Tincture recommendations may be 0.2 mL two to three times daily, up to 3 to 5 mL 1:5 tincture in 50% to 70% ethanol taken daily. Most herbal practitioners agree in recommending the daily dose be taken upon waking in the morning. (Romm, 532-533)

For women with PCOS, *Vitex* may be the botanical medicine that they choose to use for menstrual irregularity, PMS, luteal phase dysfunction, infertility, mastalgia, hyperprolactinemia, habitual miscarriage from low progesterone levels and acne, in place of pharmaceutical drugs. The risk and side effects are miniscule compared to pharmaceutical drugs if the woman does not have a history of ovarian cysts, excluding the follicular ovarian cysts common with PCOS.

Yarrow

Yarrow, whose botanical name is *Achillea millefolium*, has the common names of soldier's woundwart, knight milfoil, staunchweed, and herbe militaris. (Pedersen, 174) Constituents of

yarrow include volatile oils, terpenes like azulene, caryophyllene, and cineole, resin, fatty acids, waxes, astringent compounds like tannins and salicylic acid, bitter compounds including saponins like sitosterol and alkaloids like achilleine, trigonelline, betonicine and stachydrine.

Yarrow has astringent, diaphoretic, hemostatic, antibacterial, stimulant, carminative, (Hoffmann, 532) anti-inflammatory, astringent, hypotensive, hypoglycemic, antithrombotic, antipyretic and expectorant properties. (Pedersen, 175) Regarding the reproductive system and fertility, it is used for ovarian cysts, uterine fibroids, menstrual cramps, amenorrhea, dysmenorrhea, and menorrhagia (Romm, 130, 136-137, 146, 149)

Yarrow is contraindicated during pregnancy because of its influence on the reproductive system and menstruation. Yarrow has not been tested extensively to determine its safety while breastfeeding. Those who are allergic to ragweed may be allergic to yarrow and should be cautionary. Yarrow may increase urination, but otherwise, side effects are rare. (Hoffmann, 532) (“Yarrow”)

Common recommended dosages for yarrow are 2 to 4 mL of 1:5 in 25% tincture three times per day, 1 cup of boiling water over 1 to 2 teaspoons dried herb infused for 10 to 15 minutes for an infusion three times per day, or 2 to 4 g dried herb, or 3 to 5 ml pressed juice from fresh herb three times per day. (Hoffmann, 523-524)

Yarrow is recommended for women with PCOS because of its beneficial effects on blood sugar regulation and pelvic congestion from ovarian cysts or otherwise. As a healing herb that relaxes muscle and tissue also, it may be a beneficial, soothing addition to a PCOS woman’s protocol, especially for those who have breakthrough ovulation pain prior and during ovulation.

Galactagogues Fenugreek and Goat’s Rue-

For PCOS women who have trouble exclusively breastfeeding because of low milk supply, fenugreek and goat’s rue may be beneficial for increasing milk production. Fenugreek is thought to increase milk production through its ability to stimulate sweat production and thus milk secretion since the breast is a modified sweat gland. (Romm, 454) Goat’s rue is also a galactagogue anecdotally thought to increase glandular breast tissue and thus increase milk supply. PCOS women with breast hyperplasia may find fenugreek and goat’s rue together to promote an increase in milk supply by directly addressing the etiology of low milk supply and PCOS with these holistic herbs. Interestingly, goat’s rue has some of the similar constituents that make up metformin. Potentially by treating insulin resistance and regulating blood sugar, goat’s rue may address even more of the etiologies of low milk supply and PCOS women. (Danielsson)

In one breastfeeding clinic’s culminative experience of recommending fenugreek to over twelve hundred women, nearly all of the mothers who took fenugreek experienced a significant increase in milk production within 24 to 72 hours. They also found that fenugreek could be stopped once an adequate volume of milk production could be reached and continued as long as sufficient breast stimulation and emptying continued. This clinic noted that two to three capsules three times per day gave the best results even when the label of some brands only recommended one capsule three times per day. Fenugreek tea is an option but not as strong as capsules and has a bitter taste. No side effects were noted in the lactating mothers or their infants except for a mild maple syrup

smell to their sweat or urine which was not a cause for concern and just from the maple syrup color and flavor of fenugreek itself. (Huggins)

Note on the term Emmenagogues

The term emmenagogue applies specifically to herbs that stimulate menstrual flow and activity. Many well-meaning books call any herb that affects the female reproductive system an emmenagogue when in fact it may be a hormonal normalizer, uterine astringent, demulcent, tonic, antispasmodic or nervine, not specifically an emmenagogue. (Hoffmann, 384-385)

Homeopathy

Homeopathy is a branch of alternative medicine based on the principles that you can treat 'like with like', as in, a substance taken in large doses may create a certain set of symptoms, but the same substance taken in small doses can correct those symptoms. In other words, homeopathy assumes that an individual can be treated with minute doses of natural materials which in large doses would be expected to create the same symptoms. ("What is") (Chaplin) Homeopathy also takes into account the emotional state of the patient and a complete case history in order to act at the level of the psycho-neuro-endocrinal axis. Therefore, one woman with PCOS may take a completely different remedy from another in order to have the same results. (Joshi) Today, these highly diluted substances are mainly given in tablet form, the method used for the past 200 years, but the principles of treating 'like with like' dates back to Hippocrates (460-377 BC). ("What is") (Chaplin)

Homeopathic medicines, also called remedies, are formulated in specialist pharmacies using a deliberate and careful process of dilution and succussion, a form of vigorous shaking. Science has not been able to explain how homeopathically prepared minute substances have biological effects on the body, but we do know that biological effects are clearly seen under experimental conditions. ("What is")

In essence, homeopathy is nanopharmacology at its best. People have made the correlation that atomic bombs are never referred to as an extremely small bomb. In actuality, there is very real power to atoms smashing together. (Ullman) Because of the dilution that the remedies go through, many raise the idea that homeopathics are just water and do not have any helpful affects, or any or few solute molecules, at such high dilutions. Interestingly, Dr. Martin Chaplin has proven that "homeopathic water" and "regular water" are not the same, using nearly 2,000 references to scientific literature. (Chaplin, "Memory") (Chaplin, "That Spirit") Consequently, homeopaths credit the power of these remedies to the fact that water has memory and the structure of water changes when diluted and agitated vigorously as in homeopathics.

Other theories for the biological effects of homeopathics have come from scientists in France and Belgium. They discovered that vigorous shaking of the water in glass bottles caused small silica fragments or chips to fall into the water, raising the question of whether the silica helps to store the information in the water or if the initial natural substance interacts with the silica in some way to create the biological effects. Chemists and physicists have discovered that there is increased release of heat from water in which homeopathic remedies have been prepared, even when the repeated process of dilution suggests that there are no molecules remaining of the original medicinal substance. (Ullman)

In 2005, an overview of positive homeopathy research and surveys was compiled by the European Network of Homeopathic Researchers. One study they included looked at the effects of homeopathy for PCOS. 36 women fitting the mental picture of homeopathic remedy *Pulsatilla* were given *Pulsatilla* 6C, every 4 hours during the day for the two weeks following the menstrual cycle. This was continued for 4 cycles. At the end of the trial, 30 of the 36 women had normal ovulating follicles and no symptoms of PCOS. (“An Overview”) Testimonials of the effectiveness and curative nature of homeopathics for women with PCOS are easily found. (Deanwood) (Bienchen)

Homeopathic remedies commonly used for PCOS includes Nat Mur, Sepia, Lachesis, Lycopodium, (“PCOS and Homeopathics”) (Robert) Calcarea carb, Graphites, Thuja, and ACTH 30C to regulate the adrenals. (Card) Unlike almost every other healing modality or allopathic option, homeopathics are non-toxic, have no side effects and either work or do not. Taking homeopathics has zero risk and can only help or do nothing.

Aromatherapy

Theophrastus, an ancient Greek philosopher and botanist said, “Oils applied externally affect the body internally.” (Humphrey) The National Association for Holistic Aromatherapy defines aromatherapy as, “the art and science of utilizing naturally extracted aromatic essences from plants to balance, harmonize and promote the health of body, mind and spirit. It is an art and science which seeks to explore the physiological, psychological and spiritual realm of the individual's response to aromatic extracts, as well as to observe and enhance the individual's innate healing process. As a holistic practice, aromatherapy is both a preventative approach as well as an active method to employ during acute and chronic stages of illness or disease.

It is a *natural, non-invasive* modality designed to affect the whole person, not just the symptom or disease and to assist the body's natural ability to balance, regulate, heal and maintain itself by the correct use of essential oils.” (“What is Aromatherapy”)

Essential oils are composed of hundreds of chemical constituents which give them their power and efficacy. There are thirteen categories of chemical constituents including alkanes, phenols, terpenes, alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, oxides, lactones, coumarins and farnoids. Lavender, for example, has 200 different constituents including ester, alcohol, and terpenes. Esters are soothing, balancing, antifungal as well as stress and emotional releasing. Alcohols are energizing, cleansing, antisepti, and antiviral. Because of this, lavender is considered the most versatile essential oil and used for pain relief, insomnia, skin care, burns, insect bites, hair growth, PMS, headaches, respiratory health, relaxation, stress, allergy relief and household cleaning. The chemical constituents of clove essential oil make for simultaneous antiseptic and anesthetic when applied topically.

The purity of essential oils is determined by many factors including its chemical constituents. These constituents can be affected by a vast number of variables, including the parts of the plant from which the oil was produced, the soil condition, the fertilizer or lack thereof, geographical region, climate, altitude, harvesting methods, harvesting time and distillation process. An example is common thyme, or *Thymus vulgaris*, which produces several different chemotypes or biochemically unique variants within one species depending on the conditions of its growth, climate, altitude, and when it is distilled. Depending on the time of year it is distilled, one

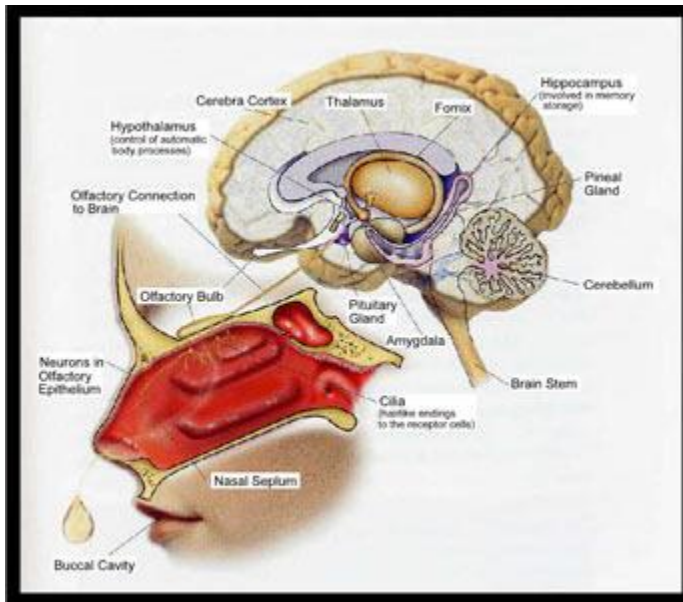
chemotype of thyme will yield an essential oil very high in thymol. If thyme is wildcrafted, a grower may produce linalol and eugenol thyme on the same mountainside and not maintain a good strain of thymol.

Therapeutic grade essential oils are distilled in stainless steel cooking chambers at low pressure and low temperature in order to preserve as many of the natural compounds as possible. High temperatures and pressure as well as contact with chemically reactive metals like copper and aluminum can destroy the compounds in essential oils and change the chemical constituents. Additionally, the plant material must be free of herbicides and other agrichemicals, because they can react with the essential oils during distillation and produce toxic compounds. If the pesticides are oil-soluble, they can also mix into the essential oils. Even though chemists have successfully created some chemical constituents of essential oils in laboratories, they lack therapeutic and medicinal benefits and may even be harmful. This is because essential oils contain hundreds of different chemical constituents, in combinations, plus molecules and isomers that are impossible to produce in the laboratory, which give them their therapeutic properties.

Therapeutic grade essential oil must go through rigorous testing to ensure that all compounds are present at the right percentage to be therapeutic, including site inspection at the farms where they are harvested and at the essential oil distillation facilities. For example, lavender oil may have excessive camphor levels caused by distilling lavender that is too green or the lavandulol may be too low due to weather conditions at the time of harvest. Lavandin, hybrid lavender, usually has high camphor levels and no lavandulol. However, Tasmanian lavandin yields an essential oil with low camphor levels which mimics the chemistry of lavender. For this reason therapeutic grade essential oils are analyzed using high resolution gas chromatography in order to see their chemical fingerprint and compare with the therapeutic-grade standard. Adulteration is also a major concern with therapeutic grade essential oils; therefore, all must be tested initially by independent European analytical laboratories, and every subsequent batch. Many companies add synthetic linalyl acetate to improve fragrance or propylene glycol, DEP or DOP to increase the volume but not change the smell. Lavandin can be heated to remove the camphor and then adulterated with synthetic linalyl acetate and be sold as lavender essential oil for \$7 to \$10 for one half ounce in health food stores, beauty, salons; grocery stores, department stores, and online.

Oils that are not therapeutic grade and are adulterated can be dangerous. Many people are known to have allergic reactions to adulterated essential oils, including headaches and skin reactions. Also, lavandin with high levels of camphor can actually burn the skin. Lavender essential oil is known for its healing effects on burns, but when people put so-called lavender essential oil on their burns, the pain intensifies and the burn worsens. True *lavandula angustifolia* contains virtually no camphor and does have burn-healing agents not found in lavandin. Not to mention, aromatherapy and essential oils gain a bad, adulterated name when oils are used that are not therapeutic grade and produce a bad outcome instead of healing. Isolated compounds of any essential oils can still be sold as "pure essential oils" and can be harmful. Therapeutic grade essential oils may need to be diluted with vegetable oil because of their strength. Citrus oils or "hot" oils like oregano can cause reddening when applied directly to the skin on those with sensitive skin. The difference between therapeutic grade and adulterated oils or isolated compounds is in the hundreds of compounds originally found in nature that balance and counteract each other. If the bottle of essential oil says "not for internal use", you know it is adulterated and

potentially unsafe. Young Living and doTerra essential oils are the only therapeutic grade essential oils currently available. (Essential, 15-26)



[picture credit](#)

Essential oils follow three main pathways to gain entry to the body including inhalation, absorption through the skin and ingestion. Inhalation through the nasal passages is a quick and effective route of treatment for many emotional problems such as stress and depression. The nose has direct contact with the brain which is responsible for triggering the effects of essential oils regardless of route they gain access. (Price et al. 125) When inhaled, essential oil molecules travel up the nose where they are trapped by olfactory epithelium. Each essential oil molecule fits like a little puzzle piece into specific receptor sites in the olfactory epithelium. This lining of nerve cells triggers electrical impulses to the olfactory bulb in the brain, which then transmits the impulses to the limbic system of the brain where taste is perceived and emotional memories are stored, like the amygdala. Also, the limbic system is directly connected to the parts of the brain that control heart rate, blood pressure, breathing, memory, stress levels, and hormone balance. The limbic lobe, which includes the hippocampus and amygdala, can also directly activate the hypothalamus. The hypothalamus is the “hormonal control center” and produces growth hormones, sex hormones, thyroid hormones and neurotransmitters such as serotonin. Because of this, inhalation of essential oils can have profound physiological and psychological effects, especially hormones responsible for youth, longevity, and energy. (Essential, 23-26)

Inevitably, when essential oils are inhaled, some molecules also travel down the pathway to the lungs where, if it is appropriate, essential oils can have an immediate and beneficial impact on any breathing difficulties. When essential oils are absorbed into the mucous linings of the respiratory pathways and arrive at the gaseous exchange in the alveoli, molecules are transferred to the blood circulating in the lungs. Inhalation methods including vaporizers, diffusers, steamers, baths, and the simple use of a tissue with essential oils on it cupped over the nose. (Price et al. 126-128)

Since skin has shown to be permeable, it has also been studied and proven that essential oils applied to the skin are absorbed into the bloodstream. Most chemicals can also be absorbed via the skin, and drugs are routinely delivered topically. Many studies have shown that essential oils are a safe penetration enhancer and increase the absorption of drugs and skin permeability many fold through their chemical constituents, like terpenes. Studies have also shown that the lipid solubility of essential oils have the ability to cross the blood-brain barrier and make contact with the fluids around the brain. Many aromatherapists appreciate the transdermal delivery of essential oils over ingestion because they are not subject to immediate metabolism by the liver. Thinner areas of the skin like behind the ears, on the eyelids, and inside the wrist have a more permeable epidermis. Generally, the number of follicles and sweat glands increase the absorption also, besides when the body is perspiring or in fever, of course. When the rate of circulation and blood flow increases whether during massage or by warmth, the speed of blood flow increases, local temperature rises slightly, and the degree of essential oil absorption also increases. (Price et al. 128-131.) Compresses, sprays, baths, foot, hand and sitz baths, and topical application are all transdermal delivery options. (Price et al. 132-135)

Ingestion is the main route employed by aromalogists in France for essential oils to enter the body. The potential effectiveness of essential oils can be increased because the digestive system extends through the body, from the mouth to the anus, and is the source of many skin, lung and ENT problems. The digestive pathway of using essential oils is beneficial for diseases and infection of the digestive organs and tissues, liver disease and urinary tract issues, diseases and infections of the pelvis, cardiopulmonary, in long term treatments, for rapid action and for people intollerant or allergic to essential oils on the skin. Using this internal pathway, every drop of essential oil used reaches the body systems, unlike inhalation when only some vapor enters the body and transdermal application where some essential oil evaporates. Most aromatherapists are concerned about excessive doses of essential oils reaching the liver with internal application. For this reason, it is essential to determine the strength of the concentration, the nature of any diluent used, and the length of time it will be taken. Vegetable oils such as hazelnut and olive oils, alcohol and honey water are all common diluents. A rough guide to the maximum safe dose is three drops, three times a day, for 3 weeks, although it can change depending on the person and particular oil being used. Ingesting an oil for too long can lead to toxic build up. Some essential oils are quite unpleasant to the taste or may irritate the mucous lining. In which case, the essential oils can be taken by mouth in capsules. Other methods of internal application are gargles, mouthwashes, rectal suppositories and vaginally. (Price et al. 135-137)

Essential oils have unique qualities which give them the ability to penetrate the skin. These same qualities, their small molecules and lipid-soluble structure, allows them to penetrate cell membranes and diffuse throughout the entire body's blood and tissues. Clove has the ability to affect every cell and organ, including the brain, by decreasing the viscosity and thickness of the blood and enhancing circulation and immune system function. Research has shown that diffused essential oils have the ability to increase atmospheric oxygen and provide negative ions, inhibiting bacterial growth. Consequently, their ionizing action breaks down potentially harmful chemicals rendering them nontoxic, purifying the air and neutralizing odors. European scientists that have studied essential oils have discovered their ability to bind with heavy metals and petrochemicals, acting as natural chelators to ferry harmful substances out of the body. (Essential, 19)

For women with PCOS, generally, a combination of essential oils are advised by aromatherapists. Basil, rose and fennel are recommended for amenorrhea. Myrrh, geranium, frankincense, melaleuca and basil are recommended for ovarian cysts. Ylang ylang, rose, and fennel are recommended for balancing hormones. (Higley) Chamomile, rose and jasmine are recommended for alleviating moodiness, stress, depression, irritability, anxiety, confusion and impatience, period pain and heavy periods. Chamomile is also recommended for heavy periods and painful periods. Dill, corriander, cyprus, and cinnamon are recommended for regulating blood sugar levels, weight control and curbing the appetite. (“PCOS and Aromatherapy”)

Blend Recipes for polycystic ovarian syndrome include:

10 drops of clary-sage essential oil
 10 drops of fennel essential oil
 7 drops of geranium essential oil
 3 drops of rose essential oil

Option 1: Add these amounts to 2 tablespoons of vegetable oil and gently rub over the abdomen once a day.

Option 2: Make the synergistic blend using these proportions and use 6 drops to a bath.

Option 3: Make the blend and use 5 drops synergistic blend to 1 teaspoon vegetable oil. (“Treating”)

For ovarian cysts:

Use natural tampons without chlorine. Blend:

- 8 drops Clary Sage
- 8 drops Frankincense
- 8 drops Lavender
- 8 drops Cypress
- 2 TBSP melted virgin coconut oil

Soak the mixture into the tampon. Insert overnight. Do nightly for one week, then switch for a week to:

- 8 drops Frankincense
- 8 drops Geranium
- 5 drops Myrrh
- 2 TBSP grape seed oil (“Health”)

For the following two blends, you may apply the blends neat (straight) or diluted, depending on the oils that are used. Applying 1-3 drops on the reproductive Vita Flex points, located around the ankle bone on either side of the foot down to the arch of the foot is also an option. Or, place a warm compress with 1-2 oils of your choice on location as needed. Or, apply 1-2 drops, diluted 50/50 on a tampon and insert nightly for 4 nights.

For Ovarian or Uterine Cysts:

- 9 drops frankincense
- 5 drops clary sage
- 5 drops myrrh
- 2 drops thyme
- 2 drops rosemary

For Ovarian or Uterine Cysts Recipe No.2:

- 4 drops frankincense
- 4 drops geranium
- 2 drops oregano (Essential, 315-316)

For the following two blends, there are several options for introducing the essential oils into the body. In addition to the options for the previous two blends.

Inhalation

- Diffuse your choice of oils for 30 minutes every 4-6 hours or as desired
- Put 2-3 drops of your chosen oil in your hands and rub them together, cup your hands over your nose, and inhale throughout the day as needed.
- Put 2-3 drops of oil on a cotton ball or tissue and put it in an air vent in your house, vehicle, hotel room, etc.
- If diffusing at night while sleeping, set your timer for desired length for automatic shut-off.

Topical

- Place a warm compress on the lower back and lower abdomen daily.

For Amenorrhea:

- 5 drops peppermint
- 9 drops fleabane (conyza)
- 16 drops clary sage
- 11 drops sage
- 5 drops jasmine absolute

For Amenorrhea Recipe No. 2:

- 10 drops chamomile
- 10 drops fennel (Essential, 297)

Acupuncture

Acupuncture is a 3000 year old form of Chinese medicine where small, sterile, disposable needles are placed at specific points on the body, depending on the condition and bioelectromagnetic meridian points that are called for. (Dang) By western explanation, acupuncture

points have electrical sensitivity and stimulating these points by inserting acupuncture needles stimulates nerves that are connected to the hypothalamic-pituitary system. Because the hypothalamic-pituitary glands are responsible for producing neurotransmitters and hormones, the body's natural pain-killing hormones which play a large part in the endocrine system, and thus control the serotonin production from the brain, acupuncture not only has an overall calming effect but is very effective for depression, infertility, PMS, arthritis, back pain and more. Physiological effects that have been noted after acupuncture include increased circulation, decreased inflammation, pain and muscle spasm relief, and increased T-cell count which supports the immune system. (Joswick)

A 2010 randomized controlled trial of 84 women with PCOS published in the *American Journal of Physiology- Endocrinology and Metabolism* showed that electro-acupuncture lowered androgen levels, increased cycle regularity and decreased acne. Specifically, this study showed that exercise and electro-acupuncture together had the best effect compared to exercise alone or mentioning the importance of lifestyle to PCOS patients with no follow-up or supported goals. (Jedel, et al)

A meta-analysis of four studies was conducted by the South Western Sydney Clinical School of Australia in 2010 and showed that acupuncture is a safe and effective treatment for women with PCOS and did not have the side effects associated with pharmacologic treatment of PCOS. After reviewing the studies, it is thought that acupuncture may have a role in treating PCOS by increasing blood flow to the ovaries, reducing ovarian volume and the number of ovarian cysts, controlling hyperglycaemia through increasing insulin sensitivity and decreasing blood glucose and insulin levels, reducing cortisol levels and assisting in weight loss and anorexia. (Lim and Wong)

Acupuncture is considered to be extremely safe, and any side effects are extremely rare. Patients report a pin prick feeling when needles are inserted and sometimes feel a dull ache around the area where needles are inserted. (Joswick) Acupuncture is an option for PCOS women with less risk, and similar if not better, success rates when compared to allopathic medicine especially for infertility and the etiology of PCOS.

In conclusion, research has shown that prescriptions and surgery are not necessarily the best option for women with PCOS, especially if their goal is erasing symptoms and promoting fertility. In fact, research and science show that lifestyle is the cause of the etiology of PCOS and the solution. Because of this, there is no reason PCOS and its symptoms should rule women's lives. Instead, PCOS should be a way for women to become stronger, healthier and more confident as they learn about the syndrome that they possess and the best way to heal their bodies. Logic says, and women know, that most women are more likely to choose the natural option before the allopathic option. In this case, those choices are based on evidence-based research and time-honored traditions. All women with PCOS should be presented with all of their options and have access to knowledge and research. This will allow them to have children of their own, lead productive, optimally healthy lives, and take responsibility for their own future health and the health of their families, in a naturally healthy way. Women need to know that a diagnosis of Polycystic Ovarian Syndrome is just the beginning, and a lifetime of health and fertility is an option for them, if they so choose.

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