Caffeine, conception and pregnancy: how much is too much?

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As this question is a source of much controversy within the medical infertility community, it may be worthwhile to learn more about caffeine and review some of the studies fueling the debate.

Where caffeine is found and how it is used
Caffeine is a bitter, white crystalline xanthine alkaloid psychoactive drug. It is most commonly found in the bean (the pit/seed inside the fruit) of the coffee plant, however, it can be found in the beans and leaves of other plants. Caffeine occurs naturally in various foods, such as chocolate, tea and coffee, but can be manufactured as an additive in beverages, including cola/energy drinks and, most recently, alcoholic beverages. Caffeine is also found in many headache/migraine medications and over-the-counter (OTC) preparations to help lose weight, prevent drowsiness and boost energy levels. Many herbal preparations contain varying amounts of caffeine, either as an additive or a naturally occurring substance from the caffeine-rich plants included in the preparation. In humans, it is a central nervous system stimulant and has mild diuretic properties. Caffeine is the most widely used psychoactive drug in both the United States and the world. Global consumption was estimated at 120,000 tons per year in a 1997 Australian Broadcasting Company program about caffeine. In North America alone, 90 percent of adults consume caffeine daily.

Caffeine levels in common sources
The average per capita caffeine consumption is estimated to be between 200 mg to 280 mg per day per adult. The following is a list of some common sources and their caffeine content in milligrams:

- Coffee, brewed: 8 oz, 102-200 mg
- Espresso: 1 oz, 30-90 mg
- Tea, brewed: 8 oz, 40-120 mg
- Soda: 12 oz, 22-72 mg
- Energy drinks: 16 oz, 80-260 mg
- Headache/migraine medication, 60-65 mg
- Alertness preparations, 200 mg
- Chocolate, various: 1.5 oz, 9-31 mg

Health risks of caffeine
Over the past 40 years, researchers have found strong evidence linking caffeine to a wide range of serious health concerns, including the following:

- Anxiety attacks
- Cancer
- Decreased fertility
- Fetal growth restriction
- Fibrocystic breast disease
- Heart attack
- Heart palpitations
- Hyperactivity
- Hypertension
- Miscarriage
- Osteoporosis
- Premenstrual syndrome
- Sleep disorders
- Sperm abnormalities
- Stroke
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Subsequent studies have refuted the results of many of the original studies for various reasons, including poor study design, inaccuracies in self-reporting of ingested volumes.
of caffeine and the nonreported presence of comorbid conditions.\textsuperscript{4,7} Researchers are currently focusing on how much caffeine needs to be ingested in order to cause concern.

**Opposing views on how caffeine consumption affects conception and pregnancy**

One of the most widely debated fertility issues involves how much caffeine, if any, needs to be consumed in order to negatively affect reproductive health. Recent studies show conflicting results. A study by Dulgisz L, et al. from Yale University in the 1990s followed 1,909 women, hoping to conceive, who consumed caffeine daily. Study results showed the risk of not conceiving during a 12-month period to be 55 percent higher for women who consumed 1 cup of coffee daily, 100 percent higher for women who consumed 1½ cups to 3 cups daily and 176 percent higher for women who consumed more than 3 cups of coffee daily.\textsuperscript{5} Retrospective analyses by other researchers believed that these study conclusions were inaccurate as they were not well controlled for other risky behaviors often associated with high caffeine intake, such as smoking or poor nutritional habits.\textsuperscript{4,6}

Another study by Infant-Rivard C from McGill University in Canada in 1993 concluded that consuming 2 cups to 3 cups of coffee (more than 300 mg of caffeine) one day before conceiving may double the risk of miscarriage.\textsuperscript{4} A 2008 retrospective study by Savitz D, et al. from Mt. Sinai School of Medicine in New York showed that consuming 200 mg or more of caffeine daily may also double the risk of miscarriage. Another retrospective study by Weng X, et al. from Kaiser Permanente Medical Center Oakland reported similar findings in that caffeine daily intake of 200 mg or more during preconception and pregnancy "significantly increases the risk of miscarriage."\textsuperscript{11,12}

Just as there are studies showing the negative impact of caffeine on conception and pregnancy, there are articles showing no negative impact as well. A 1991 study by Barr HM, et al. from the University of Washington showed 1,500 pregnant women experiencing no negative impact on birth weight, birth length or head circumference with moderate caffeine intake (1½ cups to 2 cups daily).\textsuperscript{4,6} In addition, a small study of 210 women trying to conceive while drinking caffeinated teas was completed in 1998 by Caan B, et al. at Kaiser Permanente Medical Center Oakland. Study results showed daily consumption of more than ½ cup of black or orange pekoe caffeinated teas increased the chances for conception twice as much as not consuming these teas at all. Apparently hypoxanthine, a chemical found in tea, has been reported to help foster egg maturation and even fertilization. Researchers also believe that aromatic polyphenol compounds found in brewed tea may inhibit the development of "nonviable embryos."\textsuperscript{11}

**“Safe” recommendations**

Given the variances in study outcomes, there is no official "safe amount" recommendation for caffeine intake for those trying to conceive or for women who are pregnant. It is also not clear if caffeine helps women to conceive. Although a "safe amount" recommendation remains elusive, many trusted institutions and medical societies have advocated their own guidelines over the years. It is problematic however, that complete standardization regarding volume or milligrams for daily consumption does not currently exist. Only the American Medical Association and the March of Dimes address safe daily levels during the conception period. A summary of findings from those organizations, among others, are as follows:

- The March of Dimes recommends 200 mg or less daily during conception and pregnancy.\textsuperscript{3}
- The FDA recommends moderate (200-300 mg) daily intake or abstinence during pregnancy.\textsuperscript{7}
- The American Medical Association recommends moderate (200-300 mg) daily intake is safe during conception and pregnancy.\textsuperscript{3}
- The American College of Obstetricians and Gynecologists recommends limiting intake to 1 to 2 cups of coffee per day\textsuperscript{2} (no specifics as to mgs of caffeine or "cup" volume provided).
- The UK Food Standards Agency recommends <200 mg caffeine daily in pregnancy.\textsuperscript{7}
Conclusions

Despite differences in study outcomes and the recommendations from various respected organizations quoted above, I believe we can draw the conclusion that daily caffeine consumption >300 mg may pose a potential risk during pregnancy and preconception. Avoiding medications and OTC products containing caffeine prior to conception and during pregnancy seems to be reasonable. In addition, minimizing daily caffeine consumption, cumulatively and from all sources, would appear to be the most prudent course for women who are pregnant or trying to conceive.

About the author:
Sherry Lipari, LPN joined Walgreens specialty pharmacy as a clinical education specialist in January of 2010. Sherry has been a licensed practical nurse since 1978. Her experience in infertility comes from working more than five years in a variety of positions at the Reproductive Science Center of the San Francisco Bay Area (RSC). Sherry started at RSC as a nurse case manager and then moved to nursing supervisor and clinical operations manager, before being promoted to director of operations in 2009. She has hosted a roundtable session at the American Society for Reproductive Medicine (ASRM) annual meeting and authored several Clinical Update publications. Prior to working in infertility, Sherry spent 18 years in the field of nephrology and kidney transplantation. She is a current member of ASRM.

References
