



THE EXPERIMENTAL EFFECTS OF STRESS ON FERTILITY

& POSSIBLE SOLUTIONS TO THE PROBLEM

B S J

By Jenna Koopman

Imagine entering a pharmacy and going into the fertility and prenatal aisle. You might see a few pregnancy tests, an ovulation predictor kit, and perhaps even some contraceptives. These all make sense: you might already be pregnant, you could be trying to get pregnant, or you may want to avoid pregnancy altogether. Now imagine that right next to the ovulation kit sits a little box that tells you how stressed you are. Is this relevant when it comes to pregnancy?

The scientific answer is yes. Studies from the past several decades demonstrate that high stress levels strongly correlate to infertility in both humans and non-human mammals. However, the solution to stress-induced infertility remains under debate, with both Western and Eastern methods of medicine weighing in on the argument.

Defining Fertility and Stress

Fertility is an organism's ability to bring viable offspring into being. Infertility can be due to any number of problems affecting reproductive health, such as low sperm count or immature ova (eggs).

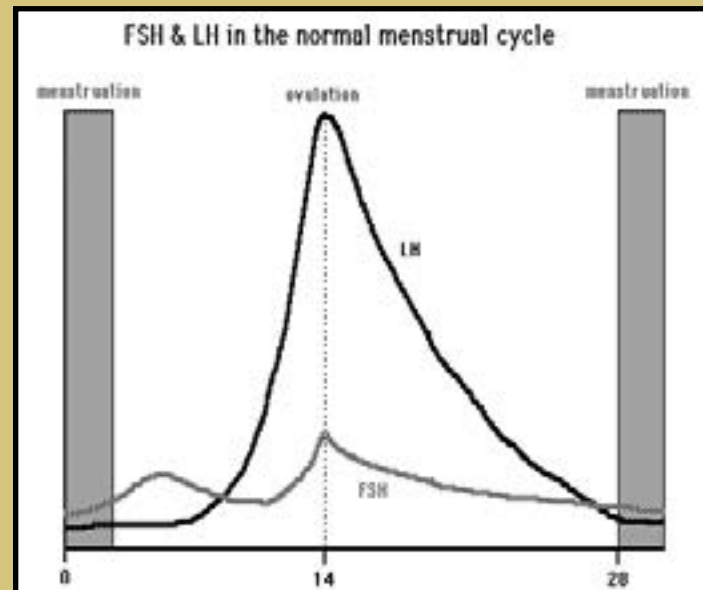
Scientifically, stress can have any number of definitions. In the context of mammals, two main forms of stress exist in biology: physical stress (such as carrying a heavy load) and emotional stress (such as grieving the death of a loved one). However, both forms of stress elicit a similar hormonal response. The body responds to different types of stress largely by activating the endocrine organ system, releasing stress-related hormones such as cortisol and adrenalin.

Hormonal Control of Stress

When stressed, the concentration of cortisol, a glucocorticoid produced in the adrenal glands, increases in the body. As a result of the increase in cortisol concentration, the concentration of luteinizing hormone (LH) decreases in the ovaries of females, disrupting or even halting ovulation. Luteinizing hormone controls whether or not an ovary releases a mature egg, a process known as ovulation. As the

menstrual cycle ends, LH levels increase, surging in anticipation of ovulation, at which point LH decreases. When luteinizing hormone is inhibited, the ovary does not release an egg, and conception becomes impossible (WebMD, 2013). Beyond conception, cortisol still plays a role in fertility: high levels of cortisol are strongly associated with miscarriage ("Stress and Fertility," 2013).

Example of normal menstrual cycle and Luteinizing hormone levels.

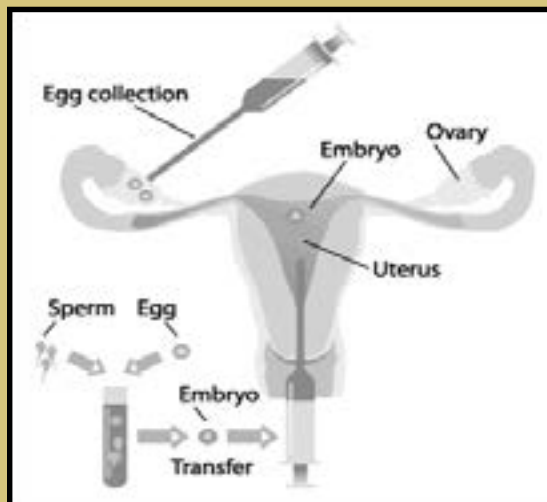


Adrenalin (also known as epinephrine) is another stress-related hormone in the body. Adrenalin is the hormonal factor which triggers the fight-or-flight response in humans usually associated with a physical stressor. When the body undergoes physical stress, the adrenal glands produce adrenalin to promote increased blood flow to muscles, allowing the body to respond more quickly to external stimuli ("Adrenaline", 2013).

Studies from the past several decades demonstrate that high stress levels strongly correlate to infertility in both humans and non-human mammals.

Adrenalin correlates to fertility levels as well. In patients undergoing IVF, or in-vitro fertilization, hormones are injected into the body to encourage eggs to mature. These eggs are then removed from the body and fertilized with sperm in a petri dish in order to create embryos. These embryos are then placed back into the uterus, at which point it is hoped that some will implant and begin to grow into a baby. In IVF patients, studies show that when daily adrenalin levels are lower, the rates of implantation increase. Other studies have shown a similar correlation when measuring cortisol levels. These results indicate that when patients lead less stressful lives, they are more successful at reproduction (Csemiczky, Landgren, and Collins, 2001; Facchinetti, Matteo, Artini, Volpe, and Genazzani, 1997).

Example of in-vitro fertilization:



Studies Link Stress and Infertility

In the laboratory, studies consistently show stress to be a highly significant factor in infertility. Correlations between high stress levels and infertility have been found in non-human species as well.

For example, 30% of stressed male mice placed with receptive females for four days were unable to impregnate the females as compared to only 4% of unstressed male mice (Crump & Chevins, 1989). In another study with female rats, (Lane & Hyde, 1973) stressed females gave birth to significantly smaller litters than their unstressed counterparts even when mated with the same males. Additionally, the litters were more likely to be mostly females rather than an equal distribution of gender, helping to confirm

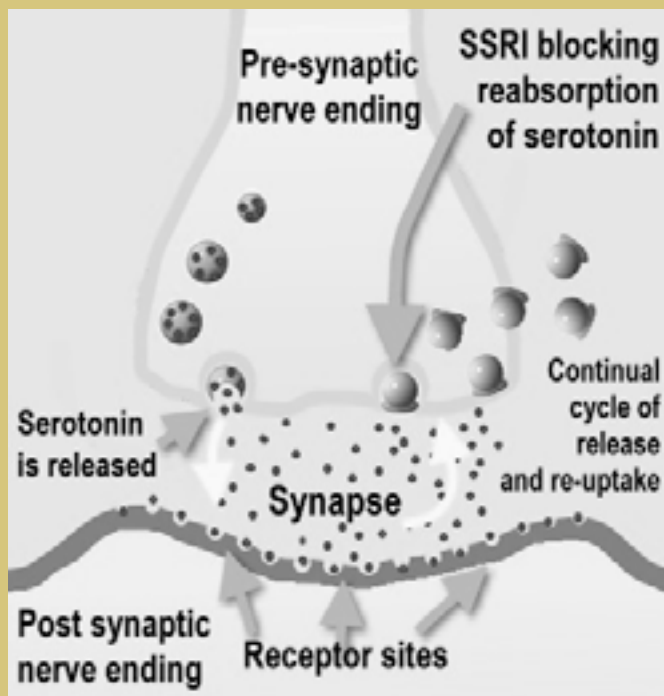
the theory that schizophrenic (i.e. highly stressed) females are much more likely to deliver female offspring (Lane & Hyde, 1973). This suggests that the male gamete does not survive well in a female's uterus under stressful conditions, although the exact mechanism through which this occurs remains unclear.

With regard to human reproduction, stress in the form of mental illnesses and mood disorders can increase infertility as well. In one study, (Ramezanzadeh et al., 2004) both depression and anxiety levels in women trying to get pregnant positively correlated with length of infertility. However, this study does not prove that depression or anxiety cause infertility because the women were already infertile at its outset. Instead, infertility and the emotional connotations thereof could lead to anxiety and depression.

Medication

Although anti-anxiety medications may reduce stress, they also have disadvantages which hinder fertility as well. This is due to the occurrence of certain side effects such as a decrease in sexual drive and inability to orgasm that result from taking anti-anxiety medications and antidepressants. For example, certain SSRIs (selective serotonin re-uptake inhibitors) can reduce anxiety and help patients with Major Depressive Disorder and Obsessive-Compulsive Disorder. These same SSRIs cause reduced sexual drive and can cause erectile dysfunction in males, making conception unlikely if not impossible. (Zoloft Oral: Side Effects, 2013.) Thus, faced with these potential complications, patients sometimes seek out alternative treatments for infertility.

Stress in the form of mental illnesses and mood disorders can increase infertility as well.



Example of SSRI blocking reabsorption of serotonin.

Conclusion

Essentially, there are no foolproof methods of increasing one's fertility in spite of stress, but there may be some ways of reducing stress through traditional Eastern medicine which can lead to a decrease in infertility and better health overall. On the other hand, for those hoping to prevent pregnancy for now or forever, overcommitting to too many different classes, jobs, and other engagements may serve as a slightly effective birth control.

Acupuncture may be one of the best treatments for stress-induced infertility. Acupuncture is a traditional Chinese form of medicine which requires a patient to lay down while an acupuncturist places needles into the patient's body at certain locations, called meridians. In one study, female patients undergoing IVF had much lower self-assessed levels of anxiety if they received acupuncture in the four weeks prior to the procedure (Isoyama & Cordts, 2012). These women were then more likely to have successful implantation occur post-procedure.

Another method of stress reduction and a way to boost fertility is yoga. A study conducted on women over a three-month time period demonstrated that practicing yoga regularly can actually lower salivary cortisol levels (Michalsen et al, 2005). As cortisol levels are in part to blame for infertility, it could be highly beneficial to practice yoga for its stress-reduction benefits in order to increase one's fertility. Benefits from yoga are not limited to the fertility of women.

Studies show that many fertility benefits for males come from regular yoga practice. Both sperm count and motility show improvement in men who practice yoga. Prostate size can decrease as well. All of these factors can help improve fertility in males. (Sengupta, Chaudhuri, & Bhattacharya, 2013).

Sources

"Adrenaline." *You & Your Hormones*. Society n.d. Web. 27 Oct. 2013.

Crump, C. J., and P. F. D. Chevins. "Prenatal Stress Reduces Fertility of Male Offspring in Mice, without Affecting Their Adult Testosterone Levels." *Hormones and Behavior* 23.3 (1989): 333-43. Science Direct. Web. 30 Sept. 2013.

Csemiczky, G., Landgren, B.-M. and Collins, A. The influence of stress and state anxiety on the outcome of IVF-treatment: Psychological and endocrinological assessment of Swedish women entering IVF-treatment. *Acta Obstetrica et Gynecologica Scandinavica*, 79 (2000): 113-118.

Facchinetti, F., Matteo, M.L., Artini, G.P., Volpe, A., and Genazzani, A.R. An increased vulnerability to stress is associated with a poor outcome of in vitro fertilization-embryo transfer treatment. *Fertil Steril*, Vol 67(2), Feb 1997: 309-14.

Isoyama, D Cordts, de Souza van Niewegen, A.M., de Almeida Pereira de Carvalho, W., Matsumura, S.T., Barbosa, C.P. Effects of acupuncture on symptoms of anxiety in women undergoing in vitro fertilisation: a prospective randomised controlled study. *Acupunct Med*, 2012 Jun 30(2): 85-8.

Lane, E. A. and Hyde, T.S. "Effect of maternal stress on fertility and sex ratio: A pilot study with rats." *Journal of Abnormal Psychology*, Vol 82(1), Aug 1973, 78-80.

"Luteinizing Hormone." *Women's Health*. Web MD, n.d. Web. 5 Oct. 2013.

Michalsen, A., Grossman, P., Acil, A., Langhorst, J., Ludtke, R., Esch, T., Stefano, G.B., Dobos, G.J. Rapid stress reduction and anxiolysis among distressed women as a consequence of a three month intensive yoga program. *Medical Science Monitor* (2005);11:555-61.

Ramezanzadeh, F., Aghssa, M.M, Abedinia, N. Zayeri, F., Khanafshar, N., Shariat, M., Jafarabadi, M. "A Survey of Relationship between Anxiety, Depression and Duration of Infertility." *National Center for Biotechnology Information*. U.S. National Library of Medicine, n.d. Web. 30 Sept. 2013.

Sengupta, P., Chaudhuri, P., Bhattacharya, K.. Male reproductive health and yoga. *Int J Yoga* 2013;6:87-95.

"Stress and Fertility." *White Lotus Naturopathic Clinic and Integrative Health*. N.p., n.d. Web. 30 Sept. 2013.

"Zoloft Oral: Side Effects." *Drugs and Medications*. WebMD, n.d. Web. 5 Oct. 2013.

Image Sources

Steiling, Evie. "Still Here". February 2011. *The Steilings*. Blogspot. November 13th 2013.

Lutening Hormone levles < <http://www.gpnotebook.co.uk/menst.gif>>

In-vitro fertilization method < <http://lakecharlesobgyn.com/Images/PCOS-9-ivf.gif>>

SSRI effects < <http://www.alanpriest.f2s.com/images/Synapse.jpg>>