Contraception and the Body: An Analysis of our Changing Biology

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Life 2.0 Review Paper
Bio401 / Senior Seminar
Wheaton College, Norton, Massachusetts, USA
December 1st, 2014

Humans are one of many species to have sex for pleasure (Goldman, 2014). This motivates our species to use sex beyond its evolutionary intentions of reproduction. Our bodies, however, have not evolved to the point where we can reject pregnancy if we decide we don't want to reproduce. This motivated the hybrid system of contraceptive technology with the biological aspect of healthy, fertile women who wish to not get pregnant. Birth control methods have existed for thousands of years (London, 1982). All of the methods, except oral pills, that exist today for modern birth control have existed in some form in contraceptives history, even dating back to the ancient world (London, 1982). Techniques were also utilized to prevent impregnation of the woman, including douching genitals with vinegar as one popular technique, which was less effective than *Coitus Interuptus* (London, 1982). Pessaries were a highly effective method utilized, which would form a physical barrier before the cervix (London, 1982). Some were made of solid materials such as wads of grass or linen (London, 1982). Others were made of ingredients (crocodile feces, honey, and sodium carbonate), which would combine and soften in the body to cover the opening of the cervix (London, 1982). The few described techniques all involved the body at a physical level. It was not till the 1960's that we were able to contracept at the molecular level with the introduction of the oral birth control pill (Nikolchev, 2010).

In this paper, the analyzed technology of the hybrid system is the specific contraceptive measure of the oral birth control pill. The pill was designed to inhibit ovulation by tricking the body into believing it was already pregnant with the presence of extra hormones (Planned Parenthood, 2014). Estrogen and progestin are the commonly used and known hormones of which the pill is made (Planned Parenthood, 2014). While wild side effects were incredibly damaging at the beginning of oral contraceptive trials, the pioneers of birth control discovered that lowering the levels of hormones that were introduced into the body to a certain threshold would decrease the intensity of the side effects while still maintaining its effective nature (Dhont, 2010). This information could give evidence to why women take pills with different hormone dosages, depending on the side effects they experience.

As described above, the body before oral contraceptives was likely far more susceptible to pregnancy given the inconsistencies in other contraceptive methods (London, 1982). While the many other techniques present were rather effective, they all required physical blocking or rinsing of the genitalia (London, 1982). These were all temporary techniques that were used at the time of copulation, not long term (London, 1982). Therefore, female bodies would not have to physiologically adapt long term to the use of any of these items.

The biology of the hybrid system includes the MHC, or the Major Histocompatibility Complex, which is one component by which people rate attraction to each other (Wenner, 2008). It is affected by the hormonal changes that occur within the phases of the reproductive cycle, which is the other component of the biology of the hybrid (Wenner, 2008). Pregnancy begins as the molecular level, altering the amount of hormones present during certain times of the woman's estrous cycle (Puri, 1982). Normally, these follicles would mature for ovulation, but the hormones tell the body it is already pregnant and therefore does not need to ovulate, or release the eggs (Feder, Brown-Grant, Corker, 1971). Without the hormonal influence of oral contraceptives, a follicle is permitted to mature (Feder et al., 1971). Once it has done so, a large release of estradiol, a form of estrogen, is released (Feder et al., 1971). Large quantities of estradiol give way to large quantities of luteinizing hormone, which causes the release of the egg from the follicular sac (Feder et al., 1971). Once the egg is released, sperm is able to intercept it within the fallopian tubes (Sanaz, Kulp Makarov, De Jonge, 2009).

Since the development of oral contraceptives, we have been able to alter birth control methods at a molecular level (Nikolchev, 2010). Birth control contains mostly estrogen and progestin, both hormones emitted during pregnancy (Kinder, Kojima, Bergfeld, Wehrman, Fike, 1996). With increased levels of progestin and estrogen, it hinders the release of follicle stimulating hormones (Kinder, et al., 1996). This results in the inhibition of follicle development, and therefore cannot emit estradiol (Kinder, et al., 1996). This, in turn, stops the release of the egg since estradiol didn't prompt the luteinizing hormone that allows the release of the egg (Kinder, et al., 1996).

As suggested above, the adjustment of the females' reproductive cycles can cause a potential shift in which mate types they are attracted to based off of the MHC (Wedekind, Füri, 1997). The MHC is a protein involved in our immune systems (Doty, Müller-Schwarze, 1992). These proteins are believed to interact with the bacteria of our skin and alter our scents (Doty, Müller-Schwarze, 1992). Data suggests that our pheromones, chemicals which act as scents, seem to be interlocked with the endocrine system, which is responsible for hormone communication (Kohl, Atzmueller, Fink, Grammer, 2001). It is believed that because of this, our pheromones change with our estrous cycles since they are times of increased progestin and estrogen hormones (Stern, McClintock, 1998). While it is strongly believed that these elements within the hybrid system are connected, more research needs to be completed in order to definitively state the exact functions that cause this shift in MHC preference. While MHC seems to play a large role in mate attraction, there is evidence that it is not the only component that contributes to determining mate preference (Buss, Barnes, 1986).

When we are pregnant, our varying levels of hormones tend to put our bodies in post-mating state, which is thought to change our MHC inclination (Bryner, 2008). Therefore, the theory is that we tend to want more MHC similar people in our lives during this period where we cannot yet start reproducing again (Roberts, Gosling, Carter, Petrie, 2008). This is thought to be because our system typically

thinks of an MHC similar person as a relative, which from an evolutionary standpoint could help to rear the child (Roberts, et al., 2008). A woman on birth control experiences a similar hormonal shift to a pregnant woman, and could therefore experience an inclination to have an MHC similar person in her personal life, perhaps a mate (Roberts, et al., 2008). A woman who is neither pregnant nor on birth control is said to experience a shift towards MHC dissimilar because her body is seeking out a mate, whom she would want to be as dissimilar as possible from her to promote a wider spread of immune system defenses in their offspring (Roberts, et al., 2008).

Oral contraceptives seem to be an intentional outcome to a widespread problem. The practice behind birth control is to alleviate population stress and ensure premature pregnancy does not occur (Potts, Campbell, 2011). However, the hormone influx clearly has a dramatic impact on the female biological systems. A steady increase in divorce rates has been observed in tandem with the timeline of birth control, which is a possible implication of the oral contraceptives (Wenner, 2008). Researchers believe that selecting a mate while on birth control could have an effect on your MHC preferences (Wedekind, Füri, 1997).

FIGURES

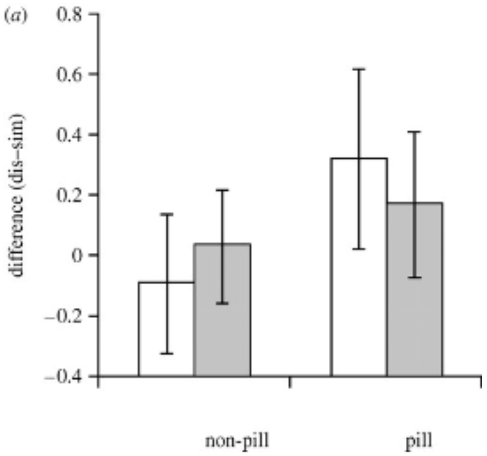

Figure 1. MHC Dissimilarity Preferences and Smell rated by Odor Pleasantness. An increase in preference for MHC dissimilarity in non-pill users and a decrease in preference of MHC dissimilarity for pill users is observed when comparing both sessions (Roberts et al., 2008). The study was done over two sessions; the first where all women were not on birth control and rated the odor pleasantness of men's t-shirts, the second where approximately half the women had been taking birth control for 5-9 days and all women rated the t-shirt for odor pleasantness. These sessions are represented by the color-coded bars – white represents the first session, gray represents the second. The "difference (dis-sim)" heading on the y-axis shows the degree of MHC variation between the woman who is smelling and the man who wore the t-shirt; as the bar grows in height, it indicates that the woman is selecting for more and more MHC dissimilar smells of men. Note: this graph measures the MHC preferences based on odor pleasantness of men's t-shirts, which is only one aspect of how women rated the t-shits. The compilation of this figure, as well as Figures 2 and 3 illustrate the concepts discussed in this paper, as well as Roberts et al., 2008.

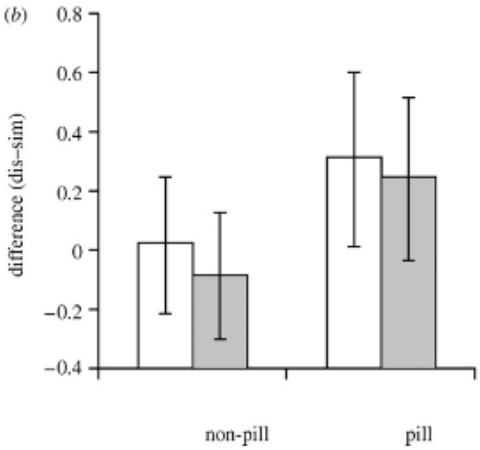

Figure 2. MHC Dissimilarity Preferences and Smell rated by Odor Intensity. An decrease in preference for MHC dissimilarity in non-pill users and a decrease in preference of MHC dissimilarity for pill users is observed when comparing both sessions (Roberts et al., 2008). The study was done over two sessions; the first where all women were not on birth control and rated the odor intensity of

men's t-shirts, the second where approximately half the women had been taking birth control for 5-9 days and all women rated the t-shirt for odor intensity. These sessions are represented by the color-coded bars – white represents the first session, gray represents the second. The "difference (dis-sim)" heading on the y-axis shows the degree of MHC variation between the woman who is smelling and the man who wore the t-shirt; as the bar grows in height, it indicates that the woman is selecting for more and more MHC dissimilar smells of men. Note: this graph measures the MHC preferences based on odor pleasantness of men's t-shirts, which is only one aspect of how women rated the t-shits. The compilation of this figure, as well as Figures 1 and 3 illustrate the concepts discussed in this paper, as well as Roberts et al., 2008.

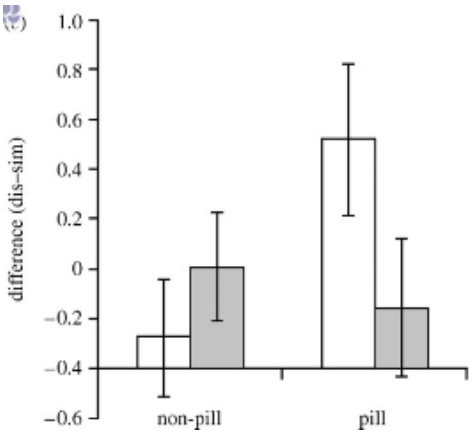

Figure 3. MHC Dissimilarity Preferences and Smell rated by Odor Desirability. An increase in preference for MHC dissimilarity in non-pill users and a decrease in preference of MHC dissimilarity for pill users is observed when comparing both sessions (Roberts et al., 2008). The study was done over two sessions; the first where all women were not on birth control and rated the odor desirability of men's t-shirts, the second where approximately half the women had been taking birth control for 5-9 days and all women rated the t-shirt for odor desirability. These sessions are represented by the color-coded bars – white represents the first session, gray represents the second. The "difference (dis-sim)" heading on the y-axis shows the degree of MHC variation between the woman who is smelling and the man who wore the t-shirt; as the bar grows in height, it indicates that the woman is selecting for more and more MHC dissimilar smells of men. Note: this graph measures the MHC preferences based on odor pleasantness of men's t-shirts, which is only one aspect of how women rated the t-shits. The compilation of this figure, as well as Figures 1 and 2 illustrate the concepts discussed in this paper, as well as Roberts et al., 2008.

Women often go on birth control at younger ages to help to regulate their menstrual cycle (American Society for Reproductive Medicine, 2011). Once they find the appropriate birth control method that has the least amount of side effects, they tend to remain on that contraceptive. Many women go on birth control around 15 and use it till approximately age 44, adding up to nearly 30 years of their lives using contraceptives (Guttmacher, 2014). An emerging future option is male birth control. Working inside the body, researchers have discovered an array of options about future male contraceptives (Garside, Gebril, Alsaadi, Nimmo, Mullen, Ferro, 2013). One injectable option would cause a polymer block in the vas deferens, a tube responsible for the transport of the sperm from the testes to the urethra (Male Contraception Information Project, 2014).

Over the past 50 years of oral contraception's existence, research has made huge strides to improve how the medicine affects the female system. Effectiveness of birth control has been evidenced by the decreasing teenage pregnancy rates, especially within the past few decades (Sifferlin, 2013). Overall, oral contraceptives have seemed to support a revolution for population control. However, now it is time to look into methods that will not alter our physiological biology so intricately where it has the capability to affects our lives and potentially the wellbeing of our future. The future of the hybrid might, therefore, shift from the biological changes in our endocrine system and perhaps turn to the idea of physical barrier chemicals that do not alter our chemical balance, rather halt the process of pregnancy inside the reproductive system altogether.

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