

Contraceptive Methods in the United States: the Question of Abortive Mechanisms

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**Abstract**

This thesis reviews the many methods of contraception available in the United States. Although society's understanding of women's health has become a major topic, there is still a significant deficit of information regarding how the accessible methods affect women's bodies, specifically reproductive tissue. The thesis analyzes numerous contraceptive options focusing specifically on the mechanisms of action to determine whether options have abortifacient properties so that readers may develop educated opinions regarding medical and ethical uses. Information involving strengths and limitations of each technique and the effects on both the female body and the reproductive material assist in understanding the process by which proposed outcomes are reached and the specificity of whether they have accomplished only their intended goal.

### **Contraceptive Methods in the United States: the Question of Abortive Mechanisms**

With a dramatic transformation in American society in recent years, there has been a newly developed promotion of women's health and the social acceptance of the termination of pregnancies. These subjects enter the cultural sphere with a shortage of commonplace information which leaves people questioning how to make an opinion of their own outside of the one that the outspoken media hands to them by the outspoken media. Although the media currently publicizes these topics, especially that of abortion, extensively, society has concentrated insufficient attention on mechanisms of contraception. The topic of contraception is taboo in many families, religions, and schools. In general, women are aware of their options when they do not desire a pregnancy, but the majority understand hardly more than the basics of contraception. Initially avoiding the pregnancy entirely could prevent all the associated ethical dilemmas. And yet, many of these options to prevent the pregnancy are abortifacients in nature based on their mechanism of action to block implantation after conception. Once a woman thoroughly understands the mechanism of action, she can feel comfortable making an educated decision about her health. With an emphasis on the different ways that hormonal contraceptives impact the body in an abortive nature, this thesis will categorically examine the major forms of contraception, focusing on effectiveness, strengths, limitations, and mechanisms of action to reach the intended result.

#### **An Overview of Methods**

Contraception covers a wide expanse of techniques including either natural or artificial methods. The natural or fertility-based awareness methods involve abstinence, natural family planning, lactational amenorrhea, and coitus interruptus. The artificial methods can be further broken down into barrier, hormonal, intrauterine, and permanent methods. Barrier methods

include condoms, diaphragms, cervical caps, sponges, and spermicides. Hormonal methods include combined oral contraceptive pills, progestin-only pills, implants, injections, patches, and vaginal contraceptive rings. Intrauterine methods focus on types of intrauterine devices. Permanent methods of sterilization involve tubal ligation, vasectomy, and sterilization implants. This thesis will further discuss each method to instill valuable knowledge.

### **Natural Methods**

Natural methods are nonpharmacological options of contraception, including abstinence, natural family planning, lactational amenorrhea, and coitus interruptus. Most of these methods are formed from a foundational knowledge of the physiology of female reproductive organs and how it pertains to avoidance of pregnancy. With these types of birth control, there should not be any fertilization of an egg, making the dispute over abortive mean moot. And yet, some of these forms of birth control are still morally debated among different religious and philosophical groups who consider the methods to interfere with a supernatural being or force. For instance, the Catholic Church, similar to Judaism and Islam, is opposed to contraception because it produces a negative connotation on the subject of the procreative inevitability of sexuality and treats an eventual child as a negative consequence (Belmonte et al., 2018). The key strength of these methods is that they avoid unnecessary medical risks and complications. For example, other methods may require physician appointments with medical costs and procedures or prescriptions with hormonal alterations that could negatively influence health. Major shortcomings include the education and self-discipline they require, as well as the inconvenience and interference with sexual intimacy. Outside of abstinence, no one can guarantee the efficacy of these natural methods, though many methods have high success rates.

**Abstinence**

Abstinence refers to not engaging in any form of sexual activity or genital contact encompassing vaginal, oral, or anal interaction (Health & Human Services, 2019). Abstinence is the healthiest way to prevent teen pregnancy (American Pregnancy Association, 2019). This is related to the lack of material touching or entering the body. Therefore, there is no risk of side effects. As far as its effectiveness, it is the only 100% successful method of preventing pregnancy and sexually transmitted infections (STIs) and thus, the most effective form of birth control (Health & Human Services, 2019). However, for complete achievement of the intended goal, people must practice abstinence consistently with commitment from both partners. The mechanism of action, although seemingly evident as sexual activity does not occur, works by ensuring sperm cells in semen never enter the vagina to meet an egg for fertilization (Health & Human Services, 2019). This way, there is no exchange of bodily fluids resulting in an inadequate environment for reproduction (American Pregnancy Association, 2019). The lack of fertilization verifies that there is no risk for abortifacient characteristics in this form of birth control.

Abstinence provides many strengths and limitations, avoiding pregnancy being at the top of the list of advantages. Abstinence decreases the risk of developing STIs and cervical cancer, has no side effects nor health risks, does not require medical appointments, is free and readily available, can be long term or for only a time in different seasons of life (American Pregnancy Association, 2019; Health & Human Services, 2019). “Relationships that involve sexual intercourse are filled with physical, emotional, and psychological risks,” all of which abstinence prevents (American Pregnancy Association, 2019, para. 7). As for shortcomings, willpower and discipline are necessary, abstaining may be difficult in the moment, and, if poorly

communicated, partner pressure may overcome the determination (American Pregnancy Association, 2019; Health & Human Services, 2019). The restrictions of abstinence may make the method unappealing, yet for some, it is the ideal form of contraception, especially considering the guaranteed achievement rate at averting pregnancy.

### **Natural Family Planning**

Natural family planning involves a collection of approaches for pregnancy prevention, including the calendar rhythm, standard days, two day, ovulation, and Sympto-Thermal method by understanding monthly patterns of fertility to know when pregnancy is more likely so that people can avoid intercourse (Health & Human Services, 2019). This fertility awareness method works by teaching women to identify signals of fertility and to keep a record of the monitoring. Sexual activity does not occur during fertile portions of the month. The educational training in anatomy and physiology necessary to use this method accurately includes understanding length of menstrual cycle, hormone levels, body temperature, cervical mucus secretion characteristics, and cervical positioning (Family Planning, 2019). For women who have a 28 to 30-day menstrual cycle, ovulation usually occurs within the twelfth and fourteenth days (USC Fertility, 2020). While sexual activity before ovulation resulted in ovulation, no pregnancy was followed if sexual activity occurred only after ovulation (USC Fertility, 2020). People can combine any of the approaches of this method for optimal prevention of pregnancy in a style that does not utilize any drugs or devices. When people follow all these components, the average success rate at avoiding pregnancy is 90% (Family Doctor, 2017). On the other hand, if people follow the method perfectly, it can be up to 99% effective (National Health Services, 2018). The mechanism of action of preventing sperm contact with eggs during the fertile window bears no consideration towards abortifacient techniques.

Multiple strengths and limitations sway women towards or away from the use of natural family planning. Strengths of this method include little to no financial burden, lack of side effects, meets spiritual standards, and can be stopped at any time without effect on menstrual cycle (Family Doctor, 2017). Limitations of fertility awareness are that it may not be conducive to breastfeeding, may cause irregular menstrual patterns, and involves keeping a careful and constant record of scheduled ovulation that may not always be perfectly consistent (Family Doctors, 2017). For best results, a trained specialist should teach how this method works, and this may not be possible financially. Illness, stress, travel, lifestyle, and hormonal treatment may affect fertility indications, so that information is not reliable (National Health Services, 2018). This would nullify the value of monitoring the body. Limitation of natural family planning include that it offers no protection against STIs; sexual activity will need to be avoided or another form of contraception will be required during ovulation; a few months of practice may be necessary before an acceptable grasp of the method is met; and continuous commitment is essential (National Health Services, 2018). Fertility awareness demands responsibility but may be the best option for some seeking an alternative birth control.

### **Lactational Amenorrhea**

Lactational amenorrhea refers to the deterrence of egg production, ovulation, and therefore pregnancy while solely breastfeeding on demand for the first six months after giving birth (National Health Services, 2018). Exclusively breastfeeding entails feeding the infant every four hours during the day and six hours during the night which causes the body to stop ovulating naturally, resulting in the inability to get pregnant regardless of sexual activity (Planned Parenthood, 2020). Because ovulation is not occurring, menstruation is also absent, hence, the name amenorrhea. In other words, the mechanism of action of this method is that of preventing

ovulation, or the release of an egg, so that sperm cells do not encounter an egg during sexual activity. Because the sperm cannot fertilize the egg, there is no question of whether this method has any abortive mechanisms. The Institute for Reproductive Health conducted a study that found that lactational amenorrhea is a safe, convenient, short-term way to delay pregnancy with an average of 99.2% efficacy rate (Coly, 2019). As with all birth control methods other than abstinence, there is still a risk of an unwanted pregnancy.

Strengths of this form of birth control include that it is free, safe, immediately preventative once nursing is begun, does not interrupt intimacy, decreases risk of breast cancer, decreases postpartum bleeding, no prescription and little to no medical appointments are necessary, and breastfeeding is already recommended for best practice of infant nutrition benefiting both the baby and the mother in numerous ways (Planned Parenthood, 2020). This method was developed to let women count on breastfeeding as a natural form of birth control because breastfeeding suppresses fertility in the first few months postpartum. A woman can consider this method if her menstrual period has not reappeared since delivery, she is not supplementing infant nutrition with other food or drink but rather feeding on demand regularly day and night, and if the baby is younger than six months old (Coly, 2019). Due to these restrictions, this is only an option for a small population. When all criteria are met, there is only a 1.2% risk of pregnancy (Coly, 2019). Additional disadvantages include that this method should not be used if the newborn has specific metabolic disorders, the mother has human immunodeficiency virus, acquired immunodeficiency syndrome, or active tuberculosis, or if the mother uses certain drugs such as mood-altering drugs, reserpine, ergotamine, cyclosporine, bromocriptine, radioactive drugs, lithium, and anticoagulants (Coly, 2019). These mainly relate to the potential of cross-contamination through breast milk which would harm the mother or

baby. The drawbacks of this method also include that it is not a long-lasting method only working for up to six months, breastfeeding exclusively can be difficult and requires dedication, and breastfeeding has some side effects such as decreased vaginal lubrication when aroused disturbing intimacy (Planned Parenthood, 2020). In general, this form of natural birth control is an option for postpartum women who meet the requirements.

### **Coitus Interruptus**

Coitus interruptus, also known as withdrawal or pulling out, is a form of birth control by the act of participants removing external male genitalia from the female prior to release of semen (Health & Human Services, 2019). Coitus interruptus functions by preventing sperm from entering the birth canal and fertilizing an egg. Withdrawal timing is based off the male's judgment of physical sensations (Health & Human Services, 2019). Because it is not an exact science, but left to interpretation, there is a greater susceptibility to ineffectiveness.

Unfortunately, the failure rates are high with coitus interruptus with roughly only an 80% success (Mayo Clinic Staff, 2020). Similar to other natural methods, ethical standing behind the mechanism of action, is resolved of any question of abortive properties because no zygote, or fertilized ovum, is created; therefore, none can possibly be destroyed.

Benefits of withdrawal are that it is readily available as a primary or back-up method, is free of charge, is free of side effects and related health risks, and requires no medical fitting or prescription (Mayo Clinic Staff, 2020). The naturalness of this method logically makes it an opportune consideration for people in many life circumstances. Pulling out is suitable for couples with motivation to do it correctly, have religious or philosophical reasons to avoid other forms, need immediate contraception when in the act of sexual intercourse without an alternative method present, do not frequently need birth control, or are wanting a temporary form while

waiting to begin another type (Centers for Disease Control & Prevention [CDC], 2017).

Difficulties of this method include that it requires self-control and proper timing of the withdrawal, does not protect against STIs, and disrupts sexual pleasure (Mayo Clinic Staff, 2020). Along with these disadvantages, its low success rating may dissuade some from use.

### **Artificial Methods**

Artificial methods of contraception cover a broader array of options to reproductive aged men and women. This category includes barrier, hormonal, intrauterine, and permanent methods. Because this category does not include abstinence, there is not a 100% success rate for any of these methods at preventing pregnancy (Health & Human Services, 2019). However, these techniques have proved themselves successful options at preventing pregnancy for many women.

### **Barrier Methods**

Barrier methods prevent fertilization by blocking sperm from entering the uterus and traveling to meet the egg in a physical or chemical manner (American College of Obstetricians & Gynecologists [ACOG], 2018). These methods consist of condoms, diaphragms, cervical caps, sponges, and spermicides or vaginal chemicals. The contraceptive mechanism of barrier methods is preventative of sperm entry to the cervix to avoid fertilization. Because sperm and egg should never meet, an embryo should not be created. However, if sperm passes through the impediments and fertilizes an egg, there is no mechanism to prevent growth of the zygote like that of hormonal methods. Hence, there is no abortive mechanism of barrier methods.

This form of contraception is often a part of an amalgamation of nonpharmaceutical mechanical barrier methods combined with chemical spermicidal methods: foam, cream, gel, suppository, and film (ACOG, 2018). Generally, the effectiveness of these methods is lower than hormonal methods, yet there are not nearly as many side effects because little

pharmacodynamics and pharmacokinetics are taking place without hormonal alterations (Healthwise Staff, 2018). Although the technical effectiveness is higher if people use the methods perfectly, on average, these methods are 72-82% successful at preventing pregnancy when considering human error in the equation (ACOG, 2018). Although the lower effectiveness is a drawback of these methods, a significant benefit of these methods is that people can purchase condoms, sponges, and spermicides over the counter, while a healthcare provider must prescribe some diaphragms and all cervical caps (ACOG, 2018). Doctors usually recommend spermicides for use with these methods, and people should reapply spermicides between each new encounter of sexual activity. People can accidentally dislodge barrier methods from place during sexual activity. This thesis will further review each of the barrier methods further.

### ***Condoms***

This mode of contraception comes in a male or female form and is generally made of a flexible latex, polyurethane, or sheep intestine tube that has one closed end and one open end so that it can act as a physical barrier between sperm and the uterus (Healthwise Staff, 2018). Males place theirs over external male genitalia while females insert theirs deep into the birth canal with a ring over the cervix so that it stays in place. The condom is 95-98% effective (National Health Services, 2018). Human error can decrease this high success rate when people make mistakes. For best results, people should pair the condom with another method like a spermicide. Health care professionally recommend that people use the condom with a water-based or silicone lubricant to decrease irritation and the risk of it breaking (ACOG, 2018). Rather than avoiding ovulation or thwarting implantation, the condom works by stopping sperm from entering the woman's reproductive system. If the sperm achieves its goal of reaching the egg, there are no back-up mechanisms in place with condom use to end the pregnancy. Advantageously, condoms

are less expensive and easy to access, do not affect hormones, can be used immediately after delivery, do not affect breastfeeding, and provide the best protection from STIs other than abstinence, (ACOG, 2018). Moreover, females can insert their type eight hours before sexual activity. The one-time-use characteristic be both an advantage and a disadvantage because people must buy new ones for each use, but people avoid time they spend in the care of cleaning them. The main disadvantage of this method is that people can be allergic to the condom's latex material (ACOG, 2018). People must throw them away after using them one time.

### *Diaphragms*

Made of rubber or silicone, a diaphragm is a firm yet flexible dome-shaped ring that covers the cervix (Healthwise Staff, 2018). It builds a structural barrier between sperm and egg. Diaphragms are 92-96% effective (National Health Services, 2018). The success rate reflects perfect use of the diaphragm without human error, which may decrease efficacy. People should always use a diaphragm along with a spermicide (Healthwise Staff, 2018). Effectiveness is expected, though not guaranteed, while a method free of risk of abortive mechanisms is guaranteed. The presence of diaphragms disturbs neither hormones nor breastfeeding, and people can put it in hours before intimacy (ACOG, 2018). After sexual activity, people need to remove the diaphragm, clean it with soap and warm water, and store it for future use (ACOG, 2018). The diaphragm can cause irritation, allergic reactions, or urinary tract infections, has no protection against STIs, cannot be used as a contraceptive until the cervix returns to normal size six weeks postpartum, and must remain in place for more than six hours to prevent sperm penetration but less than 24 hours after sexual intercourse to avoid toxic shock syndrome (ACOG, 2018). Although there is a one-size diaphragm that fits most women, a physician can size a more effective diaphragm.

### *Cervical Caps*

The cervical cap is comparable to a large thimble made of rubber that, similar to the diaphragm, suctioned securely over the cervix and is used with a spermicide (Healthwise Staff, 2018). As with other barrier methods, it is recommended to be used in tandem with a spermicide for elevated preventative success. The caps work by barricading the cervix from the natural flow of semen. The cervical cap is 92-96% effective at preventing pregnancy (National Health Services, 2018). Additionally, the cap has some benefits such as that it does not affect hormones or breastfeeding and can be placed as early as forty hours prior to sexual activity (ACOG, 2018). The cervical cap is also able to be reused after sexual activity when it is removed and cleaned with soap and warm water (ACOG, 2018). Conversely, cervical caps must be sized and prescribed by a healthcare provider, may not be used as a form of birth control for six weeks after delivery, may need to be resized if changing weight or delivering a baby, can be difficult to insert and easily bumped out of place, can cause irritation, do not protect against STIs, must remain in place for more than six but less than 48 hours after being placed, and should not be used during menstruation (ACOG, 2018).

### *Sponges*

The next barrier contraceptive method is the sponge, which is characterized as circular, soft foam containing a spermicide (ACOG, 2018). Females leave this barrier in the birth canal near the cervix so that it can block sperm admission while it releases a spermicide for 24 hours (Healthwise Staff, 2018). In nulliparous women, sponges are 88% effective, but if the woman has delivered a baby previously, sponges are only about 76% successful at preventing pregnancy (Mayo Clinic, 2019). Conveniently, people can easily access sponges at drugstores, and they do not hinder a woman's hormonal levels or ability to breastfeed (ACOG, 2018). They can be

placed 24 hours prior to sexual activity but should remain there for a minimum of six and maximum of 30 hours (ACOG, 2018). Some disadvantages of sponges are that they similarly can cause irritation, allergies, infection, or toxic shock syndrome, are less effective if used by women that have birthed a baby and so must be avoided for at least six weeks post-delivery, and do not safeguard against STIs (ACOG, 2018). Although diaphragms and cervical caps can be used repeatedly, sponges, like condoms, can only be used once and then must be thrown away (ACOG, 2018). This may be beneficial as far as cleanliness but requires continued store purchases based on sexual activity frequency.

### *Spermicides*

Although technically an artificial barrier method, spermicides are different from others in that it is a chemical called nonoxynol-9 that inactivates sperm and comes in the forms of foam, cream, gel, suppository, and film (ACOG, 2018). It is vaginally inserted near the cervix to deactivate any sperm cells that may attempt to enter the woman's reproductive system. People can use spermicides alone or with structural barrier methods, which this thesis formerly analyzed. Alone, the method is 79% effective (CDC, 2019). Using other methods collectively improves successfulness of pregnancy prevention. Because this method works by deactivating sperm, the sperm cells are no longer capable of fertilizing an egg. No zygote is created, so no abortive mechanisms can be facilitated. Some beneficial characteristics of this method are inexpensiveness, accessibility, straightforwardness, and lack of impact on hormones and breastfeeding (ACOG, 2018). Limitations of spermicides include a 10 to 15 minute activation period once inserted, a one hour limit of effectiveness until reapplying is necessary, a risk of burning or irritating skin, allergic reactions, and most concerning, that there is no prevention but actually an increased risk of developing an STI on account of the vaginal irritation (ACOG,

2018). Because of the risk of STIs, spermicides are only recommended for those with one sexual partner and a low risk of contracting human immunodeficiency virus.

### **Hormonal Methods**

Many forms of hormonal methods contain estrogen and or progestin including pills like combined oral contraceptive and progestin-only pills, implants, injections, skin patches, and vaginal contraceptive rings. Women must take the pills daily for effectiveness because they are immediate release methods. Other than the pill forms, the others are slow release methods that alter the natural release of the hormones estrogen and progestin to prevent ovulation without any action necessary for the woman (MedlinePlus, 2020). Hormonal methods carry the greatest debate over the existence of their tertiary abortive nature. The general mechanism of action is to prevent follicle development and release through ovulation (Cooper & Mahdy, 2019). The secondary process is impeding cervical penetration of sperm by altering the cervical mucous (Cooper & Mahdy, 2019). The deterioration of the endometrium as a present third mechanism that may prevent implantation of a fertilized zygote lacks discernible evidence (Cooper & Mahdy, 2019). Although progesterone causes endometrial atrophy, scientists have not been able to retrieve a blastocyst that was terminated because it was unable to implant itself in the endometrium (Nelson & Massoudi, 2016). Although indisputable evidence was not encountered, the sheer fact that these methods are used as back-up plans after conception attests to the functioning of the third mechanism that terminates a developing embryo by preventing implantation. Many other distinguished scientific healthcare organizations recognize this third mechanism as a factor in contraception such as the Mayo Clinic that lists it transparently as a component (Mayo Clinic, 2020a).

### *Oral Contraceptive Pills*

Oral contraceptives are the most widely used reversible form of contraception (Burchum & Rosenthal, 2019). Women use birth control pills throughout the country to avoid conception, which is the fertilization of an egg by sperm that results in pregnancy (Brenner & Stevens, 2018). Available oral contraceptive birth control pills fall into one of two main categories: combined oral contraceptives and progestin-only pills. The combined oral contraceptive pill also known as “the pill,” is made up of a combination of estrogen and progestin (CDC, 2019). The progestin-only pill referred to as the “mini-pill” is made up of the hormone progestin alone (CDC, 2019). Oral contraceptives are the methods of choice for many women who desire a simple and easy-to-follow plan. They appear harmless in ease of use, having little to no mechanical difficulties nor interference with the spontaneity of intimacy. But what these seemingly innocent pills actually do once in the body deserves some consideration.

**Effectiveness.** As a drug’s effectiveness is the most important quality of a drug, reflecting on success rates is necessary to understand from where the desire to use the medications comes. The efficacy is found by calculating the percent of unexpected pregnancies that ensue while using the specific method (Burchum & Rosenthal, 2019). This method’s high success rate puts it towards the top of the desirable list of accessible contraceptive modes. There is a 99% efficacy rate with perfect use of contraceptive pills; however, with typical use, contraceptive pills are 91% effective (National Health Services, 2018). This means that per usual use, nine in 100 women using oral contraceptives pharmaceutically find themselves in the situation of an unplanned pregnancy.

**Endogenous Hormones.** In order to comprehend the processes of these drugs fully, one must understand the roles these endogenous hormones play in the body. Referred to together as

progestogens or female sex hormones, estrogen and progestin are produced by the ovary, promote female maturation, regulate female reproductive organs, influence bone mineral density, and affect lipid metabolism (Burchum & Rosenthal, 2019). Their role in regulating female reproductive organs is the focus here. To begin ovulation in the ovary, a follicle ripens and ruptures evolving into a corpus luteum that secretes estrogen and progestin (Burchum & Rosenthal, 2019). Thus, estrogen is primarily involved in ovulation. By the influence of estrogen and progestin, the uterus expecting implantation of a fertilized egg proliferates and prepares by increasing thickness, vascularity, and secretory activity but breaks down when implantation does not take place (Burchum & Rosenthal, 2019). Progestin, then, has its principal effect within the uterine environment. Together, these two hormones function to regulate the female menstrual cycle.

**Mechanism of Action.** When doctors give these hormones pharmaceutically for contraception, they work by three mechanisms. Oral contraceptives function by preventing full development of a woman's monthly eggs, by thickening of the cervical mucus at the opening of the uterus to stop sperm from reaching the egg, and by altering the uterine lining so that the environment is unsuitable for implantation and development by the embryo (Mayo Clinic, 2020a). In simpler terms, oral contraceptives stop ovulation, prevent sperm penetration, and halt implantation. The first two of these mechanisms prevent fertilization, while the last mechanism prevents implantation. Due to the effects of both estrogen and progestin, combined oral contraceptives avoid pregnancy by all three mechanisms mainly preventing ovulation. On the other hand, progestin-only pills mainly increase the viscosity of mucus to stop sperm motility towards the egg and thin the lining of the uterus to stop implantation, while only rarely do they keep ovaries from releasing eggs (Health & Human Services, 2019). The estrogen in the pill

suppresses the pituitary's release of follicle stimulating hormone to stop maturation, but the progestin suppresses luteinizing hormone's rise that initiates ovulation (Burchum & Rosenthal, 2019). It is impossible to get exact percentages as to how often each mechanism is used or to specify which mechanism is used during any given cycle. The main mechanism of oral contraceptives is prevention of ovulation (Brenner & Stevens, 2018). Yet, when this mechanism fails and ovulation does in fact take place, the other mechanisms must work to prevent an established pregnancy. But does pregnancy begin at fertilization or implantation? This is from where the majority of the disagreement over the ethical use of birth control pills originates.

**The Controversy.** For context to understand the content that this thesis will discuss, fertilization refers to the moment when sperm and egg unite, and the zygote's genetic material is rendered complete including the sex of the child. While on the other hand, implantation refers to the moment when the zygote attaches itself to the lining of the uterus, the endometrium, for continued development. In 1965, ACOG sought to redefine conception to refer to implantation instead of fertilization though English language dictionaries and medical dictionaries prior to and following this attempt delineate fertilization to be of the same meaning as conception (American College of Pediatrics, 2017). It is generally uncontroversial amidst the scientific and philosophical community to say that human life begins at the moment when the separate sperm and ovum's genetic information amalgamate to form one genetically unique cell (American College of Pediatrics, 2017).

Many would argue that after fertilization, destroying a preconceived being by blocking implantation is abortion. Dreweke (2014), from Guttmacher Institute, claims that contraception is not abortive stating, "A contraceptive method, by definition, prevents pregnancy by interfering with ovulation, fertilization or implantation. Abortion ends an established pregnancy" (para. 5).

When the mechanisms fail their purpose of preventing life, physicians claim that these contraceptives do not destroy an “established pregnancy” meaning an implanted embryo in the endometrium. Many would be ignorantly satisfied with this information not recognizing the controversiality of the definition of the expression “established pregnancy.” The assumption would be that the phrase refers to a fertilized zygote post fertilization. Rather, “established pregnancy” in scientific language describes an implanted embryo post implantation. Therefore, because the beginning of life is largely recognized as the moment of conception within the scientific community, hormonal methods of contraception can destroy life even if by technical terms an “established pregnancy” is not aborted.

Because many zygotes do not survive through the arduous journey across the fallopian tube and into the uterus for implantation, many medical documents refer to an “established pregnancy” only when the embryo has adhered to the endometrium as it begins its development as ‘pregnancy tissue’ into the form of a fetus. If a life, and therefore a pregnancy, begins at implantation into the woman’s uterine lining, none of the three mechanisms of action are abortifacient as they neither interfere with nor abolish an “established pregnancy.” If, on the other hand, pregnancy begins at the union of an egg with a sperm in the moment of fertilization, known as conception, then any method of contraception that utilizes the third mechanism of action preventing implantation is thereby aborting a life. When the thinning of the endometrium is a portion of the mechanism of action for the contraceptive method, there is an abortive risk of ending a life despite debate of ending a pregnancy. This altering opinion in terminology is the root cause of numerous debates throughout the medical field of knowledge. The opinion as to whether an “established pregnancy” begins at fertilization or implantation is left in the hands of

the reader. This analysis intends to reveal information pertaining to hormonal contraceptives openly and accessibly without enforcing judgment.

**Estrogens and Progestins.** Ethinyl estradiol/norethindrone is the prototype combination oral contraceptive while norethindrone is the prototype progestin-only oral contraceptive (Burchum & Rosenthal, 2019). Furthermore, ethinyl estradiol, mestranol, and estradiol valerate are the three estrogens utilized pharmaceutically. Likewise, there are eight progestins used medicinally, categorized into four generations ethynodiol diacetate and norethindrone making up the first generation, levonorgestrel and norgestrel making up the second, desogestrel and norgestimate making up the third, and dienogest and drospirenone making up the fourth generation that are all similarly effective but have different side effects. These chiefly make up the medicines known as birth control pills.

**Combined Oral Contraceptive Strengths.** Combined birth control pills provide many strengths. Combined oral contraceptives are monophasic or multiphasic varying on the amount of progestin present throughout the cycle (Brenner & Stevens, 2018). They are administered once a day starting on day five of the menstrual cycle packaged into a calendar format to enable appropriate use (Brenner & Stevens, 2018). This benefit involved in ease of use removes many of the obstacles of adherence and remembering to take the medicine. There is an option to have an extended cycle with an eighty-four-day administration paired with seven inactive days to allow bleeding episodes only four times a year rather than thirteen within a typical 28-day cycle (Brenner & Stevens, 2018). With use of contraceptives containing estrogen, there is an improvement against acne vulgaris, facial acne lesions, and dysmenorrhea (Brenner & Stevens, 2018). Estrogen oral contraceptives decrease the prevalence of endometrial and ovarian cancer (Brenner & Stevens, 2018). Along with these effects, some improvements are specific to the

drug. Drugs containing the progestin drospirenone, for example, reduce blood pressure by decreasing sodium and water retention resulting in improved tolerability with regard to weight gain, mood changes, and acne (Brenner & Stevens, 2018). The pill does not interfere with intimacy; makes menstruation regular, lighter, and less painful; decreases premenstrual syndrome symptoms; protects against pelvic inflammatory disease; and decreases the risk of fibroids, ovarian cysts, and non-cancerous breast disease (National Health Services, 2018). These benefits mount together to create a very desirable drug.

**Combined Oral Contraceptive Limitations.** The most notable limitation of combined oral contraceptives is in relation to noncompliance. If women easily forget to take the pill or occasionally miss taking the pill, they must enlist a backup method of contraception for pregnancy prevention. Limitations to combined oral contraceptives are mainly based on the resultant adverse effects. Side effects of elevated estrogen include breast tenderness, dizziness, dysmenorrhea, edema, headache, irritability, nausea, vomiting, and cyclic weight gain (Brenner & Stevens, 2018). Stroke, myocardial infarction, deep vein thrombosis, and thromboembolic complications though rare are three times more likely to occur than in women not taking estrogen containing birth control pills (Brenner & Stevens, 2018). Contraceptives with estrogen must be used cautiously with gallbladder disease, are contraindicated for women with thromboembolic disease, active liver disease, breast cancer, carcinoma of the reproductive tract, or a history of myocardial infarction or coronary artery disease (Brenner & Stevens, 2018). These possible consequences can influence women from taking these drugs. Heightened progestin leads to adverse effects from androgenic activity like acne, depression, fatigue, hirsutism, increased libido, oily skin, and noncyclic weight gain (Brenner & Stevens, 2018).

Additional limitations are the drug interactions present while taking combined oral contraceptives. Drugs that increase hepatic metabolism like carbamazepine and phenytoin as well as antibiotics like penicillin and tetracycline can decrease effectiveness of birth control pills resulting in contraceptive failure (Brenner & Stevens, 2018). There are also drug interactions with cyclosporine, antidepressants, glucocorticoids, warfarin, and dantrolene (Brenner & Stevens, 2018). This may be an issue for patients with underlying conditions who are on additional medications or who need to take new medications for resolution of an acute problem. They also do not protect against STIs (National Health Services, 2018). For females who smoke or are over the age of 35, there is a risk of venous thromboembolic disorders when combined oral contraceptive pills are taken especially if there is a medical history of cardiovascular disease (Benner & Stevens, 2018). These numerous adverse effects deter use of combined oral contraceptives.

**Progestin-Only Contraceptive Strengths.** Women should also consider the various strengths of progestin-only contraceptives. Women take this drug daily without interruption, which may be a benefit due to its regular schedule for increasing compliance, unlike combined oral contraceptives that have off days (Brenner & Stevens, 2018). Progestin-only contraceptives are recommended in women who smoke, older women, and situations where estrogen is contraindicated such as in women with a history of breast cancer, endometrial cancer, or thromboembolisms (Brenner & Stevens, 2018). As with other oral contraceptives, this method does not interrupt or interfere with the experiences of sexual intimacy (National Health Services, 2018). This drug is beneficial for situations in which estrogen therapy is contraindicated (National Health Services, 2018). Progesterone only also will not reduce the quantity of breastmilk like others nor is the miniscule quantity enough to harm the baby (National Health

Services, 2018). Many women look to this medicine as an adequate form of birth control due to its many strengths.

**Progestin-Only Contraceptive Limitations.** Limitations of progestin-only pills are related to side effects. Side effects are rare and usually decrease with use but include acne, breast tenderness, breast enlargement, changed libido, mood changes, headaches, migraines, nausea, vomiting, and ovarian cysts (National Health Services, 2018). There is increased prevalence of irregular menstrual cycles with spotting, amenorrhea, and ectopic pregnancy risk (Brenner & Stevens, 2018). Menstrual cycles may be lighter than normal, more frequent, or stop entirely (National Health Services, 2018). Vomiting and diarrhea may result in this drug being ineffective because it does not have the opportunity to be fully absorbed into the bloodstream (National Health Services, 2018). This form does not protect against STIs, must be taken at the same time each day within a few hours, and may interact with medications like antibiotics (National Health Services, 2018). The importance of remembering to take this method at the same time every day cannot be overstressed as using a backup method is necessary for contraception if it is taken even a couple hours late. Remembering to take the medicine at the same time each day may become a limitation for some people with strenuous schedules. A woman may not be able to take this pill if she is pregnant, arterial disease, heart disease, breast cancer, liver disease, cirrhosis, liver tumors, history of stroke (National Health Services, 2018). Several of these restrictions and drawback discourage use of these drugs by women.

**Synopsis.** Women throughout the country regularly use oral contraceptives despite a lack of accessible information and common understanding of the facts within the general population. Contraceptives use hormones that are naturally present as endogenous hormones in the body. Estrogen and progestin are greatly effective at preventing pregnancy pharmaceutically by using

their three mechanisms of action. These mechanisms have created a debate throughout the medical community as to whether they should be recognized as abortifacient due to the potential inhibition of development after conception of a human life. There are many strengths and limitations that may need to be considered before deciding to use combined oral contraceptives or progestin-only contraceptives. Once these considerations have been analyzed, sufficient background information is present for the establishment of one's own judgment and decision for using these drugs.

### *Implants*

Implants are small rods superficially placed under the skin of the arm that daily release the hormone progestin into the circulatory system for prevention of a pregnancy (MedlinePlus, 2020). Though insertion only takes about a minute and only a local anesthetic is used, this method can remain in place for three years with removal being a continual option (MedlinePlus, 2020). The progestin implant known most regularly by the name Nexplanon is over 99% effective and incorporates all three mechanisms of action that other hormonal methods utilize due to the presence of altered levels of progestin in the body (National Health Services, 2018). Because of the reality of the use of all three means, abortifacient mechanisms cannot be ruled out with any kind of hormonal method including progestin implants.

These progestin implants have some helpful but other inconvenient factors. Implants are good for women with which estrogen is contraindicated or who have difficulty remembering to take the pill (National Health Services, 2018). It also has no interference with sexual intimacy, can reduce dysmenorrhea symptoms, and allows fertility to return within a few weeks after removal (National Health Services, 2018). Women gain protection within a week and can use it while breastfeeding (MedlinePlus, 2020). Bruising, tenderness, swelling around the implant,

changes to menstruation such as lighter or heavier bleeding quantity, irregular or longer length of time, or even amenorrhea, symptoms like acne, headaches, nausea, and mood swings may be present, as well as no protection from STIs are some of the disadvantages of this method (National Health Services, 2018). Disadvantages of this method include that, like other hormonal methods, a medical provider must be involved in this method which may limit some from its use.

### ***Injections***

A contraceptive injection such as Depo-Provera is a single shot into muscles such as the deltoid or gluteus medius that prevents pregnancy for about ninety days thanks to the presence of the hormone progestin (MedlinePlus, 2020). Depo-Provera is the most common form of contraceptive injection and is more than 99% effective (National Health Services, 2018). As this thesis described previously, the hormone progestin prevents pregnancy by three mechanisms. That said, abortifacient mechanisms may be present. Advantages include that it does not interfere with the spontaneity of sexual activity, daily remembrance of medication is unnecessary, nor does it affect other medications, it is safe for breastfeeding moms, and it does not contain estrogen for those in which it is medically contraindicated (National Health Services, 2018). Disadvantages of this contraception are the associated side effects like breast tenderness, weight gain, menstrual changes, headaches, and depression that last as long as the injection's effectivity (MedlinePlus, 2020). Additionally, one must remember to get repeat shots before expiration, fertility takes a year to return after discontinuing, and STIs are not protected against (National Health Services, 2018). Unfortunately, women must also consider the risks of infection, allergic reactions, and thinning bones, which typically limits use to two years (National Health Services, 2018). Continued medical treatment is required because injections must be readministered every few months which may limit some women.

### ***Skin Patches***

A small, sticky skin patch slowly distributes estrogen and progestin into the blood. Women apply the patch to different areas of clean, dry, skin weekly for three weeks and then remove it for one week (MedlinePlus, 2020). The contraceptive patch is greater than 99% successful if women use it as directed (National Health Services, 2018). This efficacy makes it a very attractive option for women. The combination of the effects of the two hormones work like the combined pill that functions mainly by suppressing the release of an egg while secondarily stopping sperm entry and fertilized implantation but still including the third as it is a combined product. Some strengths of the method are that it can protect against ovarian, uterine, and colon cancer, decreases risk of fibroids, ovarian cysts, and breast disease, relieves premenstrual symptoms, has the typical hormonal method noninterference with intercourse, and works even if the woman is sick, unlike oral contraceptive pills (National Health Services, 2020). On the contrary, replacement must be remembered weekly, visibility may be an issue, skin may react poorly to its presence, STIs are not prevented, side effects like headaches, nausea, tenderness, and mood swings may be present, medications may interfere with its success, and elevated breast cancer rates have been recognized with use (National Health Services, 2018). Higher levels of estrogen increase the risk of pulmonary and peripheral blood clots, hypertension, myocardial infarctions, and cerebrovascular accidents (MedlinePlus, 2020). The patch requires access to a medical care provider.

### ***Vaginal Rings***

The vaginal ring, known frequently as the NuvaRing, is a two-inch flexible ring inserted into the birth canal by the individual rather than a physician (MedlinePlus, 2020). It remains there for three weeks after which there is a one-week allotted time off before another ring is

placed again. The ring continuously releases both estrogen and progestin into the blood for a pregnancy prevention rate of 99% (National Health Services, 2018). The two hormones sufficiently stop development of an implanted embryo by thinning the lining of the uterus where it needs to find its home for growth but may not necessarily prevent conception because all three mechanisms are enlisted when hormones are involved (Brenner & Stevens, 2018). In other words, a full-term pregnancy is prevented because even if an embryo is created in conception, it is terminated with no way of implanting itself to survive in the endometrium, yet whether pregnancy is avoided at a fertilization level is questionable depending on if the first two mechanisms were successful. Conveniently, the ring prevents pregnancy for a month without daily attention, can be effective immediately, allows for sexual activity to remain unplanned, does not allow sickness to alter effectiveness like contraceptive pills, may lessen premenstrual symptoms, allows for relatively simple application and removal, does not affect long-term fertility, and reduces risk for certain cancers (National Health Services, 2018). As far as disadvantages of this method, side effects include nausea, tenderness, vaginal discharge, vaginitis, menstrual abnormalities, estrogen-related hypertension, emboli, myocardial infarctions, and cerebrovascular accidents (MedlinePlus, 2020). Some other drawbacks of this method are risk of ring expulsion, discomfort with the idea of self-insertion, no security against STIs, forgetting to remove and replace it, certain medications that render it ineffective, and an increased risk of breast and cervical cancer (National Health Services, 2018).

### **Intrauterine Methods**

Similar though categorized slightly differently than hormonal methods, intrauterine devices (IUDs) are the most commonly used method of reversible contraception with over 168 million users across the globe (Nelson & Massoudi, 2016). The devices, which are also known as

intrauterine systems (IUS), are plastic T-shaped contraptions that healthcare providers place into the uterus that effectively prevent pregnancy (Office of Communications, 2017). This device sends out either progestin or copper in a contraceptive attempt that can remain in the body long term for 5 to 10 years (National Health Services, 2018). The four US Food and Drug Administration (FDA) approved IUDs are ParaGard Copper-releasing CuT IUD, levonorgesterel-releasing intrauterine system Mirena, Liletta/Levosert, and Skyla/Jaydess (Nelson & Massoudi, 2016). Mirena can remain in the body for roughly five years with a cumulative efficacy over those years of 99.3% (Bayer Healthcare Pharmaceuticals, 2019). With this high of a success rate, it can inadvertently become a top choice before physiology has been considered.

Whether the mechanism of action contains abortifacient characteristics becomes a crucial concern for those considering this method. The technique mostly has a spermicidal effect, but if the endometrial inflammatory changes destroy a fertilized ova or block implantation post fertilization is highly disputed (Nelson & Massoudi, 2016). As anticipated with progestin contraceptives, the focus is on blockade of the sperm without full prevention of ovulation, hence aborting a zygote cannot be ruled out. The copper ions hinder sperm movement and prevent stimulation of the sperm head's acrosomal enzymes required for infiltration of the eggs' zona pellucida for gamete union (Nelson & Massoudi, 2016). This deactivates the sperm. Other than the copper's spermicidal effect by thickening the cervical mucus to prevent sperm entry and fertilization, this method thins the endometrium and incompletely represses ovulation (Mayo Clinic, 2020b). In instances where the sperm manage to survive through the substandard uterine environment to meet an ovulating egg that has not been suppressed, there is no guarantee that an abortifacient mechanism has not occurred. When the first two mechanisms fail to prevent

pregnancy, the provision of an inadequate atmosphere for survival of the zygote in the uterine wall can act as a third contraceptive mechanism that aborts pregnancy tissue. Without a suitable home to implant itself, the zygote dies and exits the body. Listed as a “noncontraceptive benefit” in one article, IUDs act as the most effective emergency contraception when placed within 120 hours after unprotected sexual activity thanks to its placement intercepting implantation as it manipulates the endometrial cavity (Nelson & Massoudi, 2016). IUDs thwart the normal development of an embryo by taking from it a home in the uterine wall, its only means for life. Stated plainly, IUDs have the potential to put an end to life. Despite this indication of an abortion potential, direct evidence of implantation impediment by the retrievable blastocysts in the uterus has not occurred in scientific terms (Nelson & Massoudi, 2016). Nonetheless, the fact that an IUD can be placed after unprotected sex furthers the obvious point that it can end the development of a conceived life because it is considered a contraceptive option at a time when only the third mechanism would be in play even if scientists have not successfully retrieved a blastocyst to prove the mechanism as the cause of the termination of pregnancy.

An IUD has numerous strengths. This device is immediately functioning upon insertion, does not interfere with sexual pleasure, is safe while breastfeeding, and allows for resumption of fertility once removed (National Health Services, 2018). These benefits make it a desirable option for women in many different stages of life, such as teenagers, new moms, and even those near menopause. Unfortunately, there are conversely numerous down sides of this form of contraception. Vaginal bleeding may be heavier and more painful; it does not prevent STIs; there is a risk of infections during fittings, pelvic infections, thrush, perforation, rejection, displacement, uterine damage resulting in necessary surgery, and ectopic pregnancy especially if pregnancy occurs while the device is in place (National Health Services, 2018). Medical cost,

accessibility, and knowledge disparities are also limitations. Women must also consider the threat of possibly causing the abortion of a fertilized ova from intense inflammatory changes of the uterine lining that could destroy the zygote or block its implantation after fertilization when choosing this method (Nelson & Massoudi, 2016). Based on the current legal system of America, this is a decision that is left in the hands of the woman.

### **Permanent Methods**

The permanent contraceptive procedures are sterilizations involving tubal ligations for women and vasectomies for men as well as sterilization implants. Both the ligation and vasectomy methods effectively prevent pregnancy permanently. Yet, there have been recent developments of the reversibility of these methods. Furthermore, the name remains congruent with the meaning because, unless altered and reversed with another procedure, these methods remain permanent in their purpose of preventing pregnancy. There is over a 99% efficacy rate of these permanent contraceptive procedures with vasectomies having the best rate of 99.8% (Chapel Hill Obstetrics & Gynecology, 2018). Permanent methods neither prevent ovulation, nor make the endometrium uninhabitable, but rather block sperm from ever reaching the egg. Based on these mechanisms, sperm and egg should never be united; however, if by some chance that were to happen, there is no mechanism for destruction of the zygote. Without destruction of a zygote, development can continue without abortifacient mechanism.

A tubal ligation is a surgical procedure blocking and sealing the fallopian tubes which connect the ovaries with the uterus to prevent egg fertilization by sperm (National Health Services, 2018). What was once a bridge offering travel from the ovary to the uterus is now separated so that sperm cannot enter nor egg leave. Health care providers perform it under general anesthesia in a hospital either laparoscopically or as a mini-laparotomy (Chapel Hill

Obstetrics & Gynecology, 2018). Part of the fallopian tube is blocked by clips or rings, tied, cut, or even removed as a salpingectomy if necessary (National Health Services, 2018). These are most frequently done postpartum as the procedure follows almost 10% of all deliveries (Patil & Jensen, 2016).

A vasectomy is a minor operation that cuts and seals the vas deferens tubes in males. The vas deferens normally carry sperm from the epididymis to the ejaculatory duct where they are able to exit the body (National Health Services, 2018). Once ejaculated outside of the body, the semen cannot impregnate a woman because it no longer contains sperm. This method is 99% effective at preventing pregnancy (Urology Care Foundation, 2020). The procedure can take place in a urologist's office or in a surgery center where 1 to 2 small incisions are cut into the skin of the scrotum to block the vas deferens (Urology Care Foundation, 2020). By cutting and removing a small portion of the tube, the flow of sperm is permanently broken. After two to three months, sperm is no longer present so that pregnancy is permanently avoided (National Health Services, 2018).

The sterilization implants for women called hysteroscopic sterilization are flexible coils inserted into the fallopian tube that encourage scar tissue build up to block the tube as a barrier to the egg from the permeation of sperm (Chapel Hill Obstetrics & Gynecology, 2018). This puts up a dam through the natural flow of movement that an egg typically travels from the ovary through the fallopian tube and into the uterus. Unfortunately, this method has come under attack as it leads to intense pain for the woman due to the embedding of the egg into the tubes. These eggs still in the tube usually can be removed only by hysterectomy, while some eggs rupture the tube and are dislodged into other parts of the body. Thus, hysteroscopic sterilization is under

scrutiny and has since come off the market while all units that have not been implanted are being returned to the provider (US Food & Drug Administration, 2019).

Tubal ligations have the benefit of being immediately effective, having no effect on sexual activity, possibly going home the same day if it only needs local anesthetics (though most require general anesthesia) and not affecting hormones so menstruation is unaffected (National Health Services, 2018). Conversely, there are risks with tubal ligations typical of any surgery like internal bleeding, infection, and organ damage, no protection from STIs, difficulty reversing it, as well as the risk of the tubes rejoining so that there is an increased frequency of ectopic pregnancies (National Health Services, 2018). With this form of pregnancy, the zygote gets stuck in the fallopian tube where it cannot survive and must be removed surgically or else it ruptures the tube. A main strength of vasectomies is that they involve minimal local anesthesia in a urologist office so that the man can return home the day of the procedure (Chapel Hill Obstetrics & Gynecology, 2018). The procedure only takes about 15 minutes after which contraception is immediately effective, and there is no impediment of sex drive or pleasure just without the presence of sperm in semen (National Health Services, 2018). However, it takes about three months for sperm to be completely cleared from semen for pregnancy to be avoided (Chapel Hill Obstetrics & Gynecology, 2018). Bruising and temporary swelling may occur as there is also small risk of infection from the surgery and no protection from STIs (National Health Services, 2018). Affordability and access may also be limitations of both forms of permanent contraception. If a reversal is desired, it may take a year before pregnancy can occur (Chapel Hill Obstetrics & Gynecology, 2018).

### Conclusion

An analysis of the plentiful options for individuals desiring a way to prevent pregnancy is necessary for an educated decision on contraception use. There are many widely recognized contraceptives: natural methods of abstinence, natural family planning, lactational amenorrhea, and coitus interruptus; artificial barrier methods: condoms, diaphragms, cervical caps, sponges, and spermicides; artificial hormonal methods: combined oral contraceptive pills, progestin-only pills, implants, injections, patches, and vaginal contraceptive rings; artificial intrauterine devices; and artificial permanent methods: tubal ligation, vasectomy, and sterilization implants. The effectiveness of the many methods are key components that initially attract interest in the mechanism. Once the methods have been described generally, briefly recounting strengths and limitations provides a more comprehensive understanding. Finally, an emphasis on the mechanisms of action brings light to the controversiality of the topic.

With the current emphasis on women's health and the termination of pregnancies, preventing the pregnancy in the first place is a beneficial topic to explore, yet people frequently overlook the science behind the mechanism. When the technique affects the woman's hormone levels of estrogen and progestin, the question of whether contraceptives are abortifacient is a crucial discussion. For all natural, barrier, and permanent methods, there is no risk of causing an abortion because sperm never meets egg to create a zygote. Although hormonal and intrauterine methods are primarily meant to prevent sperm and egg contact by inhibiting ovulation and deactivating sperm, people cannot rule out a third contraceptive backup mechanism of the hormones. This mechanism makes the uterine wall uninhabitable for a zygote to implant itself and further develop, thus, imposing its abortive function. When hormonal contraceptives are used, it is impossible to identify which mechanism was in effect to prevent pregnancy. During

any given month of ovulation where women do not avoid sexual activity, if they use hormonal means for contraception, an abortion is a possibility. The decision, based on ethical implications for use of contraceptives attained from this information, is in the hands of the reader.

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