THE PHYSIOLOGY OF BIRTH CONTROL

The physiologically based approaches to birth control act by preventing conception (contraception) or implantation. The simplest contraceptive approaches are withdrawal and temporary abstinence (rhythm method). In the withdrawal method, widely practiced in older cultures and developing countries, the penis is withdrawn shortly before orgasm, allowing for external ejaculation. This is not a safe (i.e., effective) method.

RHYTHM METHOD. In temporary abstinence (rhythm or "symptothermal" method), vaginal intercourse is avoided during the period when the female is most fertile. The method is based on the timing of ovulation and the survival period of sperm and egg within the female genitalia. Time of ovulation can be estimated by measuring basal body temperature every morning before leaving bed. 1-2 days after ovulation, there occurs a rise of about 0.5°C (1 °F) believed to be associated with the metabolic effects of progesterone from the corpus luteum. Time of ovulation can also be checked approximately by daily examination of cervical mucus. The mucus becomes increasingly thin and distensible under the influence of preovulation estrogen. It is thinnest at ovulation and dries in a fernlike arborizing pattern if spread thinly on a glass slide. After ovulation, the mucus becomes thick and indistensible in response to progesterone and no longer forms such a pattern upon drying. Freshly ovulated eggs are mature, but within 1-2 days can age and become overripe, unable to be fertilized.

Sperm may survive 3-4 days in the female genitalia, particularly those stored in the cervical mucosa. Thus, to avoid conception, sperm must not be deposited in the vagina for at least 4 days before and 3 days after ovulation, the remaining time of the monthly period constituting a relatively safe period.

MECHANICAL/CHEMICAL BARRIERS. One way to prevent sperm from reaching the egg is the use of mechanical barriers. The condom, a nonporous sheath made of rubber or gut, is a device used to cover the penis, preventing sperm deposition within the vagina. A diaphragm is a plastic domeshaped object placed deep in the vagina to block the passage of deposited sperm into the cervix. Similar in operation to the diagragm, but more secure, is the cervical cap, a plastic object made to fit tightly over the cervical protrusion into the vagina. Chemical spermicides containing acidic or other specific antisperm substances designed to destroy sperm in the vagina can be applied in the form of creams, gels, foams, or douches usually before intercourse. Diaphragms should be used in conjunction with spermicide foams or gels for added protection.

IUDs. It is known that the presence of a foreign body in the uterus will inhibit pregnancy. IUDs (intrauterine devices) have been developed to exploit this response. An IUD is a thin plastic or copper wire shaped in the form of a T, a loop, or a coil placed for long periods in the uterine cavity. The mechanism by which IUDs prevent pregnancy is not completely understood, but interference with implantation of the young embryo in the endometrium is widely suspected.

VASEQUCTOMY/TUBAL LIGATION. An effective way to prevent the meeting of sperm and egg is surgical sterilization, which involves cutting and tying the uterine tubes in women (tubal ligation) or the vas deferens in men (vasectomy). In sterilized women, the ligated portion will prevent passage of the egg as well as of sperm, but all hormonal and other aspects of sexual physiology are intact. In vasectomized men, sperm production and androgen secretion are normal, but the ejaculate contains seminal plasma only. The sperm emerging from the epididymis accumulate behind the ligated vas, where they age. After death, the sperm are phagocytized by macrophages.

THE "PILL". One oral contraceptive method is the "pill," which is based on the negative-feedback effect of female sex steroids on the hypothalamus-pituitary axis. In a typical situation, a woman takes one pill per day for 21 days, beginning with the fifth day of menstruation. These pills contain small amounts of a synthetic estrogenlike compound and larger amounts of a synthetic progesterone-like compound. In the body, these substances mimic the effects of natural estrogen and progesterone hormones. However, because their levels in the blood are suddenly raised from the first day the pill is taken, the hypothalamic-pituitary axis, sensing high amounts of the "hormone," will shut off GnRH, FSH, and LH levels, a response similar to that occurring during early pregnancy. In the absence of FSH and LH, follicular development and ovum maturation, as well as ovulation, will not occur (as in pregnancy), making fertilization extremely unlikely. Meanwhile, the estrogenlike and progesteronelike substances in the pill promote endometrial proliferation and secretion (not a purpose but a side effect). A day or two after a woman stops taking the pill, the endometrium, losing its support, will slough off and bleed, resulting in menstruation. Women desiring pregnancy can regain their normal cycles within one to several months after discontinuing the pill. However, pregnancy within the first 1-3 months is not encouraged because of the possibility of multiple ovulation and pregnancy that may occur due to excessive rebound secretion of pituitary gonadotropins.

Gossypol, a cottonseed oil compound, is under study in China as a reversible male chemical contraceptive. It is believed to inhibit spermatogenesis reversibly by inactivating the spermatids.