

Chapter 5

Prevention of Infertility

CONTENTS

	Page
Prevention Strategies	85
Primary Prevention	85
Secondary Prevention	87
Sexually Transmitted Diseases	87
Maternal Age	88
Iatrogenic Infertility	88
Education	89
Research Needs	90
A Strategy for Prevention	91
Summary and Conclusions	91
Chapter 5 References	92

Figure

<i>Figure No.</i>	<i>Page</i>
5-1. Testicular Self-Examination	86

Table

<i>Table No.</i>	<i>Page</i>
5-1. Prevention of Infertility	86

Prevention of Infertility

More is known about treating infertility (see ch. 7) than preventing it. Nevertheless, prevention strategies are desirable because they can avert the emotional and economic costs associated with infertility treatment, as well as preempt some infertility that would be wholly untreatable.

The most preventable type of infertility is that caused by sexually transmitted diseases (STDS). An estimated 20 percent of infertility in the United States results from STDS (4), while in some regions

of the developing world the figure is up to 80 percent (25). It is noteworthy that changes in sexual behavior, attitudes about discussion of sex, and health education wrought by the epidemic of acquired immunodeficiency syndrome (AIDS) could have the salutary effect of preventing some infertility due to STDS. But the majority of cases of infertility are not due to these diseases but instead to factors that are difficult, if not impossible, to prevent (see ch. 4).

PREVENTION STRATEGIES

Primary prevention strategies are those aimed at avoiding a disease process entirely. This can be accomplished by health promotion activities, specific medical methods of protection, or diagnosis and treatment of infection or other ills among transmitters. Secondary prevention aims at reducing morbidity once an infection or a disease has already been acquired, and restricting its spread through the population. Infertility—a clinical condition often treated by medical or surgical means, and in some instances secondary to an underlying disease—is notably difficult to prevent, although it is the target of prevention strategies at both levels.

Primary Prevention

Little solid evidence can be cited of any useful means of primary prevention of male infertility. This follows logically from the finding that a principal factor leading to infertility in men is idiopathic oligospermia—i.e., sperm count reduction of unknown origin (see ch. 4). With the cause usually not known, primary prevention of infertility in the male becomes little more than guesswork (23).

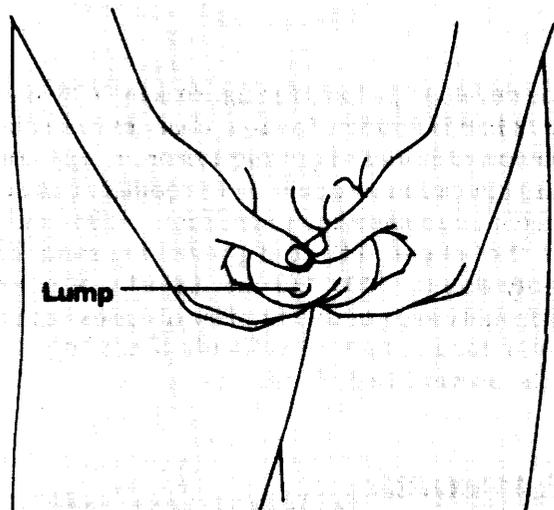
On the other hand, enhanced awareness of the male reproductive organs is easily achieved among men and may occasionally lead to early detection of threats to fertility. Self-examination of the testes, and of the male genitalia in general, is a technique

that deserves far more attention than it has traditionally received (see figure 5-1). Testicular self-examination is useful for detecting physical abnormalities and diseases, such as cancer of the testis, epididymal cysts, and STDS. Testicular cancer, which almost always occurs in only one testis, is highly curable when treated promptly. If a testicular tumor has begun to metastasize, surgical removal of the testis is usually accompanied by a dissection of the local lymph nodes to assess the extent of tumor spread. A major complication of such surgery is absence of ejaculation because of damage or removal of nerve fibers that run interspersed with the lymph channels (15,22).

Among women, the three main factors leading to infertility are tubal obstruction, endometriosis, and disorders of ovulation (see ch. 4). The principal means of avoiding tubal obstruction is primary prevention of STDS (discussed later in this chapter). Endometriosis can often be kept in check by oral contraceptives or drug therapy, but specific prevention strategies for this disease are unknown. Disorders of ovulation are probably the easiest to treat but they, too, are not clearly amenable to primary prevention (23).

With tubal ligation now the main means of contraception among women in the United States, and with vasectomy popular among men, obviously sterilization procedures must be undertaken carefully in order to prevent infertility that is later

Figure 5-1.—Testicular Self-Examination



Men can increase their chances of finding a tumor promptly by routinely performing a simple procedure called testicular self-examination.

Testicular self-examination should be performed once a month after a warm bath or shower. The heat causes the scrotal skin to relax, making it easier to find anything unusual. The procedure itself is simple and takes only a few minutes:

- Stand naked in front of a mirror. Look for any swelling on the skin of the scrotum.
- Examine each testis gently with both hands. The index and middle fingers should be placed underneath the testis while the thumbs are placed on the top. Roll the testis gently between the thumbs and fingers. One testis may be larger than the other.
- Find the epididymis (a cord-like structure on the top and back of the testis that stores and transports the sperm). Do not confuse the epididymis with an abnormal lump.
- Feel for a small lump—about the size of a pea—on the front or the side of the testis. If you find a lump, contact a doctor right away. The lump may be due to an infection or it may be cancer. Many if not most.

SOURCE: Adapted from U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, *Testicular Self-Examination*, NIH Pub. No. 85-2836 (Bethesda, MD: 1985).

unwanted. A host of other factors are weakly linked with infertility (see ch. 4). Table 5-1 reviews a range of primary and secondary preventive methods that might derive from these various contributing factors.

Freezing sperm for use at a later date can be thought of as a means of primary prevention of infertility that is subsequently caused by events either expected (e.g., radiation therapy for can-

Table 5.1.—Prevention of Infertility

Factors predisposing individuals toward infertility and preventive steps available

Sexually transmitted diseases (STDS) and pelvic inflammatory disease (PID)

- Careful selection of possible sexual partners. Health education to discourage unprotected sexual encounters. Monogamy. Forthright inquiry and check of sexual partners for risks of STDS.
- Contraception by means of condoms. Use condoms routinely with new sex partner. Media campaign to encourage condom use.
- Periodic screening for STDS, if sexually active; STDS in both males and females are commonly asymptomatic.
- Changes in societal attitudes about STDS to lessen stigma of diagnostic examination for them.
- Recognize findings of STDS and seek medical care. Ensure that correct treatment is given for yourself and partner, with followup.
- Media campaign to encourage men and women with genital discharge to be checked for STDS.
- Rapid, adequate management of PID to reduce risk of sequelae.

Pelvic infections after birth, abortion, surgery, or invasive diagnostic testing:

- Ensure that optimally safe birth and surgical services are available.
- Use prophylactic antibiotics in high-risk situations to prevent infection.

Exercise, poor nutrition, and stress:

- Recognize that regular strenuous exercise (i. e., exceeding 60 minutes daily), rapid weight loss, low body fat, and stress may cause decreased fertility. Women are at higher risk than men.

Smoking, environmental toxins, and drugs:

- Smoking, as well as other substance abuse, reduces reproductive potential and should be avoided. Environmental exposures are inadequately studied, but appear more common in males. Semen analysis can be performed.

Endometriosis:

- If strong family history for endometriosis exists, consider oral contraception and possible specific endometriosis suppression. Oral contraceptives may suppress endometriosis even in those not at high risk.
- Early diagnosis and treatment in symptomatic women. Conservative surgical approaches.

Cryptorchidism and varicocele:

- Undescended, especially intra-abdominal, testes should be treated as promptly as possible. Benefits of surveillance and treatment of varicocele are controversial.

Chemotherapy and radiation:

- Risks of gonadal damage must be considered and, if appropriate, gamete collection or protection of the gonads should be performed.

Intercurrent illnesses:

- Many acute and chronic diseases cause anovulation or decreased spermatogenesis. Prevention of these effects is by treatment of the primary disease.

Inadequate knowledge of reproduction:

- Ensure that information on reproduction is available from parents, schools, clergy, and other sources.

Inadequate medical treatment:

- Couples with difficulty conceiving should educate themselves about fertility and seek specialized care before infertility is prolonged.

Lack of perspective about reproduction:

- Discuss family life with parents, peers, and professionals. Formulate life plan that allows adequate time for reproductive goals.

SOURCE: Office of Technology Assessment, 1988

cer) or unanticipated. In fact, as reproductive technology crosses new frontiers (see ch. 15), primary prevention of infertility may acquire an even fuller

meaning. Cryopreservation of embryos-or ultimately oocytes-may give young women or young couples some assurance of avoiding infertility by being able to conceive months or years in the future despite intervening events that compromise their fertility.

Secondary Prevention

Once a symptom that foreshadows infertility occurs, a few steps can be taken to attempt to preserve fertility. As with primary prevention, secondary prevention focuses largely on STDS. Examples of such approaches include prompt rec-

ognition of signs of urethritis, vaginal infection, pelvic inflammatory disease (PID), epididymitis, or orchitis, followed by prompt evaluation by a caregiver, diagnosis, and effective treatment. Locating cases of STDS and sexual contacts of infected individuals is also an important means of secondary prevention since it allows for early diagnosis and treatment of individuals infected but not yet irretrievably affected by chlamydia or gonorrhea. In the case of endometriosis, it should be treated at the earliest possible opportunity—either medically or surgically—to provide the greatest likelihood of averting subsequent infertility.

SEXUALLY TRANSMITTED DISEASES

Infertility due to infectious disease—found in an estimated 20 percent of infertile couples in the United States—is distinguished by its preventability. Sexually transmitted diseases, principally gonorrhea and chlamydia, are important factors leading to infertility (see ch. 4). The specific risk is tubal occlusion secondary to the infection (25). The risk increases with the number of infections, the duration and severity of each infection, and any delay in instituting treatment; each of these components is a target for preventive efforts. (For a detailed review of the prevention of STDS, see 19)20.)

Public health initiatives aimed at preventing STDS and infertility include efforts in the following areas (3,6):

- health education of patients and public health professionals;
- disease definition, including long-term sequelae of STDS;
- optimal treatment and improved clinical service;
- partner tracing and patient counseling; and
- research, including on the social, psychologic, and biologic aspects of STDS.

In addition, research increasingly focuses on behavioral aspects of STD acquisition and prevention. Principles of primary prevention for sexually active individuals include: reducing the number of sexual partners; avoiding persons known to have many sexual partners; using me-

chanical barriers (i.e., condom, diaphragm, or contraceptive sponge) or chemical barriers (i.e., sper-



Photo credit: Library of Congress

Slogan promoting prevention of venereal disease

micide); periodic screening for STDS; and prompt medical care if symptoms develop (2,5,7,16,19).

According to the Centers for Disease Control (CDC), STD control for the balance of the 1980s and into the next decade will focus on the primary prevention of all sexually transmitted infections, especially the persistent viral infections for which no therapies or vaccines exist (14). This emphasis is a new one, as historically the focus has been on secondary prevention efforts. If current primary prevention efforts are successful, an overall reduction in STDS will result. This would not

affect those already afflicted with one of these diseases and associated infertility, but it may mean that infertility caused by STDS may ultimately decline.

A crucial step was taken in 1987 toward a vaccine against chlamydia, as researchers identified previously unknown details about the bacteria's outer coat. These findings should permit the synthesis of large quantities of the outer coat protein, a necessary step in developing a vaccine against chlamydia (18).

MATERNAL AGE

The calculus of infertility includes the age of the prospective mother. Female fertility decreases somewhat before age 35 and significantly more after age 35; in contrast, a decline in male fertility has not been linked to increasing age (see ch. 3). To avoid the decline in fertility related to age, some suggest that women should devote the third decade of life to childbearing and the fourth to career development rather than the other way around, as they are increasingly doing (8). Couples with access to child care or parental leave from employment may not be faced with so stark a choice.

Although no such social prescription fits all couples in all circumstances seeking to conceive, the

biology of female fertility dictates that a couple maximize the number of months or years devoted to attempts at conception. Stated simply: The more months, the better; and the earlier the attempts, the better. A woman's reproductive lifespan is circumscribed, and whenever the decision to procreate is taken, the chances of success generally depend on the number of months during which conception is attempted. For some individuals, the equation is complicated by balancing the biological advantages of attempting conception early in their reproductive careers against the social disadvantages of entering the employment career market later in life.

IATROGENIC INFERTILITY

Surgical procedures can inadvertently impair a woman's fertility primarily by producing fallopian tube or ovarian adhesions (see ch. 4). Education and sensitization of practicing physicians about the risks to future fertility posed by abdominal surgery are the primary means of preventing iatrogenic infertility. Such education can stress, for example, the aggressive initial treatment of young patients with pelvic inflammatory disease, the conservative treatment that avoids pelvic surgery in young women, and the conservative surgical treatment of ovarian cysts (21).

The most common form of iatrogenic infertility occurs when a woman undergoes a tubal liga-

tion and then seeks reversal. If the ligation was not carefully done in a fashion that conserved the fallopian tubes (e.g., if it was done with large and destructive cauterizing burns on each tube), the physician attempting to reverse the procedure is unlikely to be successful (23). One method of tubal ligation makes use of clips on the severed ends of the tubes—obviating the need for cautery—and offers the best probability for reversal.

Among men, iatrogenic infertility can also occur when sterilization—vasectomy—is done in too aggressive a fashion. Removal of too much of the vas deferens, for example, makes microsurgical reattachment exceedingly difficult. Another, hid-

den cause of male infertility stems from surgical repair of a hernia during infancy. Surgical closure of the hernia can inadvertently include the vas deferens, permanently blocking sperm transport from one or both testes.

Additional prevention strategies aimed at physicians include avoiding overprescription or incorrect prescription of fertility drugs that cause

hyperstimulation and bursting of the ovaries, and avoiding repeated microsurgery that leads to excessive scarring of the fallopian tubes (9). Also, hysterectomy ought not be automatically accompanied by ovariectomy, as is sometimes the practice, when the option of egg retrieval for surrogate gestation is available. Finally, new medicines and surgical interventions must be evaluated for side effects on both female and male fertility.

EDUCATION

Effective advocacy of preventing infertility involves developing sophisticated and focused health education techniques appropriate for a pluralistic society. The twin targets of such educational efforts are medical care providers and individuals contemplating sexual activity. The imperatives of AIDS education and behavior modification will likely push frontiers of health-related education far further and faster than previously anticipated.

Medical care providers need specific undergraduate medical and postgraduate training to improve recognition and therapy of diseases that threaten fertility. Greater general recognition, for example, that *Chlamydia trachomatis* causes severe reproductive tract damage is an immediate goal that, if accomplished, would lead to earlier detection and treatment of these infections in men and women.

One of the national health objectives of the U.S. Public Health Service (PHS) states that by 1990, at least 95 percent of U.S. health care providers seeing patients with suspected cases of STDS should be capable of diagnosing and treating all currently recognized STDS (24). A 1986 review of progress toward this goal found that training for health care professionals in the treatment of STDS had improved in recent years, but still falls short of the necessary quality and scope (14).

Since 1979, PHS has emphasized four approaches to improving the training of clinicians treating STD patients. First, 10 STD Prevention/Training Centers were established to improve the diagnostic, therapeutic, and patient management skills of midcareer clinicians directly involved with STD patients. Second, PHS has funded

the development and pilot testing of STD curricula in six medical schools. A 1986 survey found that STD training had increased in these schools to an average of 10 hours per student. The same survey showed that 44 percent of medical schools had no clinical curriculum on STDS. Third, PHS has funded an increasing number of STD Research Training Centers to encourage young scientists to pursue an academic career in STD research. Fourth, PHS has funded the development of an instructional package for clinicians who do not frequently see STD patients in their practices. Despite these efforts, the achievement of the 1990 PHS objective is in doubt (14).

A second PHS objective states that by 1990 every junior and senior high school student in the United States should be receiving accurate, timely education about sexually transmitted diseases (24). No systematic measures of this objective are available. In 1983, a Gallup poll found that only one-third of high school respondents considered themselves "very informed" and almost half considered themselves "somewhat informed" about STDS. The Centers for Disease Control has since placed increased emphasis on behavioral knowledge and attitudes related to biological facts. CDC actively promotes adoption of STD education for junior high and high school students, principally through State STD units. Increased attention to school-based education as a way to prevent AIDS should improve knowledge, attitudes, and behaviors affecting other STDS as well (14).

It is important to note that the influence that information and education can have on sexual behavior is limited (1). Individuals at greatest risk,

for example, for PID maybe resistant to conventionally given cautions. In one study, women with PID were more likely to take health risks, believe

in luck, be more socially alienated, endure symptoms longer, and have coitus with a greater number of partners (12).

RESEARCH NEEDS

Developing and implementing effective and safe preventive strategies depends on thorough understanding of the problem. At present, vast gaps in knowledge impede further progress in preventing infertility. Immediate needs for research and further understanding include (11):

- **Fuller realization and broadened inquiries into all aspects of reproduction, including sexuality.** Reluctance to scrutinize such basic human characteristics and behaviors as these retards and distorts the ability to deal with the realities of reproduction as individuals and as a society.
- **More complete epidemiological definition and analysis of decreased fertility.** Present knowledge derives from relatively small, geographically and ethnically limited surveys and case reviews. Development of methodologic techniques and uniform terminology will be crucial for measuring all aspects of infertility and communicating the results.
- **Fuller understanding of social and economic aspects of infertility for young adults, women, men, families, and society at large.** Integration of careers and reproduction remains poorly studied in U.S. populations.
- **Inquiries into both normal and abnormal male and female reproductive physiology.** Rudimentary questions remain unanswered: How does aging reduce fertility? How do body mass and composition, as well as exercise and stress, influence reproductive ability? Solutions to these and other questions could offer means to prevent these causes of infertility.
- **Specific disease-oriented basic and clinical research, which can lead to dramatic advances in prevention.** Development of

vaccines against various infectious diseases has been crucial to their control. Yet vaccine development for STDS, including *Neisseria gonorrhoeae* and *C. trachomatis*, is difficult because of incomplete understanding of the molecular biology and virulence of each organism and the means to induce a protective response in human hosts. With time and sustained supported effort, these difficulties can likely be overcome. In the meantime, new approaches to STD avoidance, detection, and treatment can be evaluated. Male responses to genital tract infections, for example, remain virtually unstudied with modern methods. Similarly, little is known about the pathogenesis or prevention of endometriosis. This common disorder remains a disease of hypotheses.

- **Better understanding of how to communicate most effectively health-related information to general populations and selected groups.** Such information has generally trickled down as news from various media or is dispensed piecemeal by care providers, parents, and friends. Initial attempts at using dynamic mass communication techniques for STD education are promising (10). The exigencies of dealing with AIDS will greatly expand and refine effective use of mass communication for motivating health-related behavior.
- **Development of reversible methods of sterilization and long-term contraception.** Contraception and conception—two sides of the same coin—are inextricably linked. Long-term contraceptives that are reliable and safe and do not place future fertility at risk are an important goal of research into preventing infertility.

A STRATEGY FOR PREVENTION

Any strategy for preventing infertility must possess certain characteristics to be effective. Such a plan must:

- be simple and understandable so it could be disseminated to the general population;
- be cost-effective—i.e., it should save more resources than it expends;
- respect individual privacy and not disrupt individuals' lives or their relationships; and
- offer an opportunity to measure its effect, so that results can be assessed.

In 1987, OTA convened a meeting of experts in Seattle, WA, to design a plan for preventing infertility that meets these four criteria (17,23). The strategy is based on people of reproductive age testing themselves to ascertain whether they have developed or acquired any risk factors for infertility. This type of preconceptional health questionnaire was recently used with a favorable response by women attending family planning clinics in North Carolina (13). Its primary purpose is not to identify people who are already infertile; rather, it seeks to identify men and women who may have a condition or lifestyle that could render them infertile in the future.

People in at least seven settings might be predisposed to completing a self-administered questionnaire concerning their reproductive potential. Each setting is one where relatively young people interact with the health care system. They are:

- individuals entering military service,
- women seeing their obstetrical/gynecologists for annual examinations,
- individuals attending family planning clinics,
- college students consulting the student health service,
- patients being seen in oncology clinics at risk of loss of their fertility,
- individuals having annual physical examinations, and
- individuals attending STD clinics.

A self-administered questionnaire can obtain information about an individual's nutritional status and social, family, medical, drug, and reproductive histories, while providing useful information keyed to the respondent's answers. Examples of specific questions and the related information that could be provided to the respondent appear in appendix B.

Implementation of this strategy for prevention has the potential to educate people exposed to the questionnaire, identify persons currently at risk who have not yet become infertile, identify persons who are already infertile, identify non-reproductive disease processes, and reduce iatrogenic infertility by enhancing patient awareness. On the other hand, such a questionnaire carries potential problems, including risking inappropriate responses by health care providers and causing respondents alarm, anxiety, guilt, regret, or apathy as their reproductive potential is described.

SUMMARY AND CONCLUSIONS

With the personal, familial, and societal losses caused by infertility inestimable and the economic costs so great, it is clear that infertility is better prevented than treated. Yet the former is more difficult. Only an estimated 20 percent of infertility—that caused by sexually transmitted diseases—is clearly amenable to prevention strategies. In those instances, curative medicine equals prevention of sexually transmitted diseases. Otherwise,

the majority of cases of infertility are difficult, if not impossible, to prevent.

Prevention of male infertility is an enigma and will likely remain so as long as most male infertility is caused by reduced sperm count of unknown origin and little research addresses this question. Among women, tubal obstruction, endometriosis, and disorders of ovulation are the principal

factors leading to infertility. Some tubal obstruction is preventable by avoiding sexually transmitted diseases, but specific prevention strategies for endometriosis and anovulation are largely unknown.

The biology of female fertility makes maternal age, especially beyond age 35, a factor in infertility. Although no social prescription fits all couples seeking to conceive, couples enhance their chances of success by maximizing the number of months or years devoted to attempts at concep-

tion, and doing so before maternal age becomes a significant factor.

Education of individuals contemplating sexual activity and of medical care providers about reproductive health and sexually transmitted diseases plays an important role in reducing threats to fertility. Gaps in their knowledge and even broader gaps in scientific understanding of normal and abnormal male and female reproductive physiology impede further progress in preventing infertility.

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