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Article in Sexually Transmitted Diseases · February 2000

DOI: 10.1097/00007435-200001000-00010 · Source: PubMed

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Vaccines Against Sexually Transmitted Infections

Promise and Problems of the Magic Bullets for Prevention and Control

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REALISTIC POSSIBILITIES FOR vaccines against sexually transmitted organisms are growing rapidly. Despite slow progress and disappointments, the remarkable growth in the understanding of the biology of sexually transmitted organisms and the mechanisms by which infection causes disease continue to fuel a great deal of optimism. The only sexually transmitted infection (STI) for which a vaccine is currently available is hepatitis B; however, efforts are underway to develop vaccines for several other sexually transmitted organisms, including *Neisseria gonorrhea*, *Chlamydia trachomatis*, herpes simplex virus (HSV), human papilloma virus, and HIV.¹⁻⁵ The health and economic costs for these STIs are high, and effective vaccines for these infections have the potential to be invaluable disease-prevention tools.

Given the enormous promise of STI immunization, many believe that current behavioral approaches to STI control are simply temporizing measures to be used while awaiting new technologies. "Until a vaccine is available..." is a phrase frequently seen in articles about STI prevention. The problem with this argument is that optimism about STI vaccines is based on our current technical capacity to develop effective vaccines. The argument ignores the psychosocial and behavioral factors that will affect vaccine delivery to at-risk persons. As progress is made toward successful clinical trials and licensing, understanding of how STI immunization will actually be implemented remains embryonic. As a result, STI vaccines may go unused for years while barriers to their dissemination are identified

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and overcome. The fact that most of sexually active adolescents remain susceptible to hepatitis B nearly two decades after an effective vaccine was introduced is clear evidence that the availability of an STI vaccine does not ensure its use.

The development of effective STI vaccination programs encompasses issues in at least two areas. First, a vaccine must be accepted by a large proportion of the at-risk population. In the absence of legally mandated and enforced STI immunization, at-risk persons must voluntarily agree to receive the vaccine. Many factors are likely to affect this decision, including individual beliefs about susceptibility, perceptions of vaccine effectiveness, family and parental attitudes, sexual and cultural practices, provider attitudes and reactions to qualities of the vaccine or immunization program (e.g., out-of-pocket costs, mode of vaccine delivery). During the past two decades, we have learned that issues of sexuality are powerful—even dominating—determinants of STI risk and preventive behaviors. Addressing these issues will almost certainly be an important part of STI immunization efforts. Second, postimmunization behavior changes may decrease the effectiveness of an STI immunization program. For example, if HIV immunization leads to a low perceived risk of HIV infection and a perception that other STIs are relatively inconsequential, subsequent increases in sexual risk behaviors could reduce the impact of the vaccine and, paradoxically, increase the incidence of other STIs.

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Received for publication April 29, 1999, and accepted August 26, 1999.

Factors Associated With Vaccine Acceptance

Some understanding of the issues associated with STI vaccine acceptance can be drawn from lessons learned about acceptance of other vaccines. Studies of existing vaccines (e.g., influenza, hepatitis B, and pertussis) have shown relatively low immunization acceptance among individuals most at risk for these conditions.^{6–12} For example, a recent study of influenza vaccination in elderly populations found that only 65.5% were vaccinated in 1997.⁷ With respect to hepatitis B virus (HBV), a number of studies have documented an unacceptably low acceptance of the HBV vaccine among health professionals. A study of North American surgeons found that nearly 30% of those without previous exposure to HBV had not been immunized.¹⁰ Similarly, research involving adult sexually transmitted disease clinic patients indicates that acceptance rates for the first dose of HBV vaccine have ranged from only 44% to 70%.¹² There is little reason to assume that vaccine availability will ensure vaccine acceptance, even for a highly feared STI such as HIV.

Acceptance of existing vaccines appears to be determined, in part, by health beliefs (e.g., perceived susceptibility to the disease, beliefs about disease severity, confidence in the benefits of immunization, and minimization of potential barriers to immunization), vaccine characteristics (e.g., efficacy and cost), and obstacles to obtaining vaccination (e.g., transportation problems).^{10,11,13–17} Our preliminary research studies on the potential acceptability of HIV and genital herpes immunization suggest that health beliefs will influence acceptance of STI vaccines.^{18–22} Recent studies of hepatitis B immunization programs for adolescents show that good vaccine coverage levels can be achieved in susceptible populations^{23,24}; however, as previously noted, these advances are taking place years after the vaccine first became available, and have yet to achieve targeted levels for vaccine coverage. In addition, open discussion of the issue of the sexual transmissibility of HBV has been largely avoided in HBV immunization efforts. This issue will have to be addressed directly when recognizable STIs are involved (e.g., gonorrhea, chlamydial infection, HIV infection, and HSV infection).

Sexually transmitted infection immunization programs may encounter unique problems. At a societal level, persons may oppose STI prevention on the grounds of sexual morality.²⁵ For instance, some argue that STIs are appropriate punishments for nonmarital sexual intercourse, and fear of the adverse health or social effects of STIs is seen as a deterrent to such sexual activity. From this perspective, STI prevention programs condone and even encourage socially disapproved forms of sexual behavior. Despite evidence to the contrary, these arguments are strongly voiced in debates about school-based condom distribution programs. Prevention of STIs by immunization may also be seen as a con-

tributor to a decline in family-centered sexual morality. Given such concerns, STI immunization may be viewed by many, including some health care providers, as unacceptable and morally dangerous.

At an individual level, several problems are likely to be associated with the acceptance of STI vaccines. Acceptance is an explicit acknowledgment of STI risk. The stigma associated with sexuality remains a significant barrier to the receipt of contraceptive and STI services in the United States. Establishing a new norm for healthy sexual behavior was recently identified by the Institute of Medicine as an important aspect of STI control,²⁶ yet progress toward this goal is lacking. As a result, open acknowledgment of having received an STI vaccine (e.g., on employment or health insurance applications) could be a powerful deterrent to STI immunization. The belief that some STIs are elements of a genocidal conspiracy against minority groups is another potentially significant barrier to successful STI immunization. For example, several research studies have documented that many African Americans distrust public health policy as it relates to AIDS.^{27–29} The long history of social discrimination and the widely publicized abuses of human rights associated with STI (e.g., the Tuskegee Syphilis Study) mean that much work remains to be done in communities with large proportions of at-risk persons.³⁰

Consent for STI immunization may be another problematic issue. Any effective STI immunization program must include young adolescents, preferably before they become sexually active. Minors are currently able to consent to many STI-related services, but it is unclear to what extent self-consent statutes would apply to STI vaccines. On the basis of our current understanding of adolescent cognitive development, it is not possible to readily evaluate which minors are cognitively capable of providing informed consent for STI vaccination. Requiring parental consent, however, will almost certainly create a barrier to immunization for adolescents who cannot discuss their sexual activity with their parents. Furthermore, immunization strategies targeting early adolescents and preadolescents will almost certainly require parental consent. Parents may be reluctant to accept vaccine-related adverse reactions—even if they are small—when the risk of an STI will presumably occur many years in the future. Some parents may fear that an adolescent would interpret a parent's approval of STI immunization as the condoning of nonmarital sexual behavior. Overall, parental acceptance of STI vaccination for their adolescent children is likely to be a key issue that will require substantial research to guide appropriate program planning.

Another important factor related to vaccine acceptance involves the attitudes and communication skills of health-care providers. A study of hepatitis B vaccination of adolescents found that the best predictor of parental acceptance was the parent's belief that vaccination was regarded as

important by the provider.¹⁷ This finding suggests that the recognition by pediatricians, family practice physicians, and other health-care providers of the importance of STI immunization for adolescents and preadolescents will be important to the success of these immunization programs. In addition, health-care providers must be willing and able to discuss STI vaccination with patients and parents of patients; however, little is known about the attitudes and relevant communication skills of the health-care providers expected to administer STI vaccines.

Postimmunization Behavior Change

Vaccine acceptance may be associated with subsequent changes in STI risk and protective behaviors. Sexually transmitted infection immunization could influence behaviors by decreasing perceived personal susceptibility to STI and by creating the perception that prospective partners are vaccinated and, therefore, "safe." These behavior changes could be especially relevant for HIV immunization. The importance of this issue is heightened by recent evidence that public perceptions of the development of more effective HIV treatments have been associated with declines in safe-sex behaviors.³¹ For example, a study of Ugandan military recruits found that 34% reported they might have more sexual partners and 50% reported they would stop using condoms if they received HIV immunization.³² In the United States, we asked 140 adolescents how they thought teen-agers would behave after receiving a highly effective HIV vaccine; 77% believed that adolescents would substantially increase their engagement in risky sexual behaviors.³³

The Need for a Psychosocial Research Agenda

Vaccines will undoubtedly represent an important new component in the STI control and prevention strategy. These vaccines may prove effective, but reliance on our scientific and technical capacity alone to develop and produce them runs the risk of experiencing what George Santayana once cautioned us to avoid when he wrote, "Those who cannot remember the past are condemned to repeat it."³⁴ The lessons of history clearly demonstrate that the benefits of technological innovation can only be realized through anticipating and understanding related psychosocial and behavioral issues.

We believe that the time has come to develop a research agenda for psychosocial and behavioral issues that anticipates the arrival of new STI vaccines. Based on past experiences, this agenda should focus on issues in three key areas:

1. The modifiable beliefs, attitudes and behaviors that will be associated with acceptance or rejection of STI vaccines. Evaluation of at-risk persons will be impor-

tant, but understanding vaccine acceptance by parents and health-care providers may be more relevant.

2. The social and cultural factors that will influence STI vaccine acceptance or rejection. This may prove to be especially challenging, because this research must acknowledge the historical use and abuse of common group designations.
3. Attitudinal and behavioral changes associated with STI immunization. If STI immunization leads to increased rates of risky sexual behavior, it will be important to evaluate and institute counseling before and after vaccination to clarify the importance of maintaining self-protective sexual behaviors, including delay of initiation of intercourse among young adolescents.

This is an ambitious research agenda, although not necessarily more ambitious than the research efforts currently devoted to the development of STI vaccines. These vaccines may become readily and widely accepted, and prove to be the long-sought "magic bullets" of STI prevention; however, there are clear reasons to question such unmodified optimism, and many opportunities to anticipate the psychosocial and behavioral issues raised by STI vaccine development. It is not too early to begin laying the groundwork for the use of these vaccines to ensure their long-term effectiveness in STI prevention and control.

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