

# Drug-Involved Women as Potential Users of Vaginal Microbicides for HIV and STD Prevention: A Three-City Survey

THEODORE M. HAMMETT, Ph.D.,<sup>1</sup> GIULIA D. NORTON, M.P.H.,<sup>1</sup>  
THERESA H. MASON, Ph.D.,<sup>1</sup> STACIA LANGENBAHN, B.A.,<sup>1</sup>  
KENNETH H. MAYER, M.D.,<sup>2</sup> RAFAELA R. ROBLES, Ed.D.,<sup>3</sup> RUDY FEUDO, Ph.D.,<sup>4</sup>  
and GEORGE R. SEAGE III, D.Sc., M.P.H.<sup>1,5</sup>

## ABSTRACT

We wished to obtain potential users' perspectives on vaginal microbicides from a population of women at high risk for HIV. We conducted a face-to-face survey of convenience samples (total  $n = 743$ ) of drug-using women and female sexual partners of male injection drug users in Bridgeport, Connecticut, Providence, Rhode Island, and San Juan, Puerto Rico. Ninety percent of respondents said that they would be very likely to use microbicides with paying partners and 78% with primary partners ( $p = 0.001$ ). High hypothetical likelihood of use was expressed even after several potential product characteristics (e.g., causes minor vaginal irritation or burning) were rated as unacceptable. Latinas had significantly higher predicted likelihood of use with primary ( $p = 0.001$ ) and paying partners ( $p = 0.018$ ) than blacks and whites. Eighty percent of respondents preferred products that enhance sexual pleasure by providing additional lubrication or "wetness." More than 80% of respondents said that they would want their primary partners to know of their microbicide use, and 42% ( $p = 0.001$ ) said that they would want their paying partners to know. Women's concern about a paying partner's violent response to suggested use of risk reduction measures was inversely related to predicted likelihood of microbicide use ( $p = 0.045$ ). Microbicides should be assessed in the context of the potential users' actual relationships and cultures. Achieving broad acceptability among drug-involved women will require a range of products.

## INTRODUCTION

**B**ETWEEN 1985 AND 1998, the annual proportion of U.S. AIDS cases among women rose from 7% to 23%. During 1998, 11,190 cases of AIDS and

6213 cases of HIV infection among women (32% of all cases) were reported to the Centers for Disease Control and Prevention (CDC).<sup>1</sup> Sixty-nine percent of the 94,000 AIDS cases reported among adult/adolescent females through 1998 for which

---

<sup>1</sup>Abt Associates Inc., Cambridge, Massachusetts.

<sup>2</sup>Memorial Hospital, Pawtucket, Rhode Island.

<sup>3</sup>Universidad Central del Caribe, Bayamon, Puerto Rico.

<sup>4</sup>Greater Bridgeport Adolescent Pregnancy Prevention Project, Bridgeport, Connecticut.

<sup>5</sup>Harvard School of Public Health, Boston, Massachusetts.

This research was supported by the National Institute on Drug Abuse grant No. R01 DA 10871.

the exposure category was known were attributed to injection drug use (50%) or sex with an injection drug user (IDU) (19%).<sup>1</sup>

Many drug-using women and female sexual partners of male drug users are in physically, emotionally, or economically abusive relationships, where they have difficulty negotiating the use of male condoms. Women's histories of physical and sexual abuse have been linked to increased levels of HIV/STDs and high-risk behaviors for these infections.<sup>2</sup> Therefore, it is important that drug-involved women have access to woman-controlled methods of HIV prevention.<sup>3-7</sup>

Topical vaginal microbicides that women could use without the cooperation or even knowledge of a male partner are under development. The detergent/surfactant-based microbicides, such as nonoxonyl 9, that nonspecifically disrupt cellular membranes, have not been shown to be efficacious in several randomized, controlled clinical trials.<sup>8,9</sup> Newer approaches include such compounds as Pro 2000/5 Gel (P) (Interneuron Pharmaceuticals, Inc., Lexington, MA), dextrin sulfate, and carrageenans, which can inhibit HIV binding to CD4-bearing cells, and such agents as BufferGel (ReProtect LLC, Baltimore, MD), which can maintain a low vaginal pH that should inhibit HIV's viability in the vagina. These compounds have undergone early phase human trials and have been found to be safe, but the proof of their efficacy awaits further studies in at-risk populations. Other microbicide approaches are being studied, including the topical use of anti-retroviral drugs, such as ((R)-9-(2-phosphonyl-methoxypropyl)adenine) (PMPA), but these have not yet been studied in humans.

If any microbicide products are to be accepted and widely used, their development must be informed by an understanding of the characteristics and opinions of their target populations.<sup>10</sup> In other words, product development and studies of product acceptability are synergistic and must be carried out simultaneously.<sup>11</sup>

We surveyed drug-involved women in three cities, Bridgeport, Connecticut, Providence, Rhode Island, and San Juan, Puerto Rico, regarding the hypothetical use of vaginal microbicides. The survey was the third component of a study that included focus groups<sup>12</sup> and product trials of inert lubricant products.<sup>13</sup> The survey was designed to test the findings of the focus groups and product trials among larger groups

of drug-involved women at high risk for HIV and STDs and to identify additional factors critical to their acceptance of microbicides.

## MATERIALS AND METHODS

Face-to-face interviews were conducted by trained interviewers with 743 drug-involved women between August 1998 and December 1998. Participants had to (1) be between 18 and 45 years of age, (2) have had vaginal intercourse with a man in the past 6 months, and (3) either have used cocaine or heroin more than four times per month in the past 6 months and not currently be in inpatient drug treatment or have had a primary sexual partner in the past 6 months who was a drug injector.

This was a convenience sample into which respondents were recruited by street outreach, fliers, and word of mouth. Informed consent was obtained from all participants prior to administration of the survey. Women were given \$15 in cash or a gift certificate for food on completing the survey.

The instrument consisted of 142 questions on the following topics: reproductive health; HIV testing, HIV status, and risk perception; current sexual relationships and risk reduction; user perspectives on microbicide characteristics; alcohol and drug use; and demographics. We asked these questions based on prior research suggesting that many of the variables listed would be potential confounders for microbicide acceptability.<sup>4,12,13</sup> Four products—three lubricants and a sponge—with characteristics and delivery methods that might be used for vaginal microbicides were shown and described to respondents. Respondents were encouraged to feel and smell each product and think about how it would be used.

Two separate analyses of the survey data were conducted using the Statistical Analysis System (SAS, Inc., Cary, NC). Separate analysis, in which responses to four questions—(1) the proportion of respondents who were "very likely" to use a microbicide if it was as effective against HIV and STDs as the male condom, (2) the proportion who would "prefer a product that made your vagina wetter than you normally are during sex," (3) the proportion who would "definitely want a partner to know" she was using a product, and (4) the proportion who would prefer a product if it

were both spermicidal and microbicidal—were compared for a variety of potential confounders, first by site and then by race/ethnicity, illicit drug use, age group, and self-reported HIV status. All analyses were conducted by partner type (primary versus paying) and employed the Breslow-Day chi-square test for homogeneity.<sup>14</sup>

In unadjusted analyses, racial/ethnic group appeared to be strongly related to a number of the dependent variables listed. To determine the magnitude and extent of confounding, we stratified the unadjusted analysis for racial/ethnic group by the following potential confounders: drug injection in the last 6 months and self-reported HIV status, for both primary and paying partners. We then compared the resulting stratified measures of effect to the unadjusted measures. A confounder was identified when the pattern or magnitude of the resulting proportions (i.e., between racial/ethnic groups) was different. As we were evaluating and adjusting for the potential impact of these potential confounders, no adjustment was necessary for multiple comparisons.<sup>15</sup>

The Breslow-Day test of homogeneity was used for each pair of racial/ethnic groups stratified by drug injection in the last 6 months and self-reported HIV status.<sup>14,15</sup> An interaction was identified when the relationship between racial/ethnic group and variable of interest differed according to the stratifier. If an interaction was present, separate chi-square analyses were performed, and separate results were presented (see Table 2). If no interaction was present, the Mantel-Haenszel technique for summary estimation of chi-square analyses was used, and summary results were presented (see Table 2).

A second set of analyses was performed to evaluate hypothetical acceptability of potential characteristics of microbicide products, as measured using a 4-point Likert scale from “definitely unacceptable” to “definitely acceptable.” The following potential microbicide characteristics were assessed: (1) “leaks out of your vagina a small amount before you have sex,” (2) “leaks out of your vagina a small amount after you have sex,” (3) “you have to insert 15 minutes before having sex,” (4) “you have to insert again before every act of intercourse,” (5) “causes minor side effects, for example, itching, burning or tingling in your vagina,” and (6) “you can not douche for several hours after having sex, or the product may not be as effective.” The analysis was conducted by each

partner type and by all the previously listed variables using Student’s *t*-tests. To identify factors associated with acceptability of specific characteristics of microbicides, a series of *t*-tests was performed on demographics and drug use history. As the drug use variables are, by definition, strongly correlated, we selected ever having used drugs as the variable to include in the final analysis, along with age (40 years and over compared with 18–39) and self-reported HIV status, which were found to be significant in an analysis of covariance (ANCOVA), using SAS version 6.12 PROC GLM. On examining the plots, the variables were determined, using SAS version 6.12 PROC UNIVARIATE, to meet standards of normality required for the ANCOVA, particularly given this procedure’s robustness with regard to the assumption of the underlying population’s normal distribution.<sup>16</sup>

## RESULTS

### *Demographics*

As shown in Table 1, the Bridgeport women were predominantly African American and most likely to be employed. The Providence group was predominantly Caucasian, oldest, most educated, and least likely to be married or in a steady relationship. The San Juan sample was 100% Latina, poorest, least educated, least employed, most likely to be HIV positive, and most likely to be married or in a steady relationship.

### *Overall perspectives on microbicides*

Ninety percent of the surveyed women said that they would be “very likely” to use a vaginal microbicide with a “paying” partner, that is, a partner who paid for sex with money or drugs, if the product was shown to be as effective against HIV and STDs as the male condom, compared with 78% with a primary partner ( $p = 0.001$ ). (Hereafter, results from this variable, an explicit item in the questionnaire, are sometimes referred to as “predicted likelihood of use.”)

Eighty-five percent of women in San Juan, 79% in Bridgeport, and 58% in Providence said they were very likely to use microbicides with their primary partner ( $p = 0.001$ ). The corresponding percentages for paying partners were 95% in San Juan, 88% in Bridgeport, and 84% in Providence ( $p = 0.046$ ).

TABLE 1. DEMOGRAPHICS OF SURVEY RESPONDENTS

Variable	Bridgeport (n = 405) %	Providence (n = 113) %	San Juan (n = 225) %
Race* (missing = 9)			
Black	72	32	0
White	6	64	0
Latina	22	4	100
Age,* years (missing = 3)			
18–24	15	6	17
25–29	26	10	21
30–34	18	24	26
35–39	20	27	23
40+	20	33	12
Marital status* (missing = 5)			
Never married	71	42	32
Married/partnered	18	14	48
Separated/divorced/widowed	11	43	20
Education* (missing = 2)	48	60	37
High school+			
Employed* (missing = 7)			
Full time	19	8	4
Part time	16	14	8
Income under \$6000* (missing = 40)	45	40	74
Self-reported HIV-positive* (0 missing)	6	5	17

\* $p < 0.05$ .

Table 2 presents key findings by racial/ethnic groups and other stratifiers. After controlling for drug injection in the last 6 months and self-reported HIV status, there remained significant differences by race/ethnicity for predicted likelihood of use with primary partners ( $p = 0.001$ ) and with paying partners ( $p = 0.018$ ). Latina women were more likely than African American or Caucasian women to say that they would use microbicides with primary and paying partners. There were no statistically significant differences between Latinas in Bridgeport and in San Juan regarding predicted likelihood of use of microbicides with primary or paying partners. However, a significantly larger percentage of black women in Bridgeport than in Providence said that they would be very likely to use microbicides with primary partners ( $p = 0.03$ ).

#### *Perspectives on product characteristics*

*Additional wetness.* Women in all three sites preferred a product “that made your vagina wetter than you normally are during sex.” Latinas were less likely to prefer wetter products for use with their primary partners. When stratified by partner type, self-reported HIV status, and drug in-

jection in the last 6 months, there were significant racial/ethnic interactions (Table 2).

The youngest women (aged 18–22) were less likely than women older than 22 to prefer wetter products ( $p \leq 0.02$ ), but there was no trend within the older age group.

*Partners' knowledge of product use.* Eighty-three percent of all respondents said that they would definitely want their primary partners (actual or hypothetical) to know that they were using a microbicide. In addition, 82% of women who reported having both primary and paying partners said that they would “definitely” want their primary partners to know, and 42% said that they would want their paying partners to know ( $p = 0.001$ ).

African American women were more likely than Latinas or Caucasians to want their primary partners to know of their microbicide use ( $p = 0.001$ ). Racial/ethnic differences regarding paying partners' knowledge were only significant between Caucasian and African American women who had not injected drugs in the past 6 months. Age group was associated with race/ethnicity in predicting respondents' desire for either primary or paying partners to know of microbicide use (Table 2).

TABLE 2. KEY SURVEY FINDINGS BY RACIAL/ETHNIC GROUPS AND OTHER STRATIFIERS

Survey statement		Latina/White %		Latina/Black %		White/Black %		Overall %
"Very likely" to use a hypothetical microbicide product if it were as effective against HIV and STDs as the male condom	Primary partner <i>n</i> = 718	85	62***	85	75***	62	75*	78 <sup>a,***</sup>
	Paying partner <i>n</i> = 357	94	79***	94	88*	79	88	90 <sup>a,*</sup>
Prefer "a product that made your vagina feel wetter than you normally are during sex"	Primary partner, HIV-positive women <i>n</i> = 63	76	100	76	100*	100	100	83 <sup>b,*</sup>
	Primary partner, woman not HIV-positive <i>n</i> = 643	78	83	78	82	83	82	81 <sup>b</sup>
	Paying partner, woman had injected in the previous 6 months <i>n</i> = 139	84	83	84	55*	83	55	81 <sup>c,*</sup>
	Paying partner, woman had not injected in the previous 6 months <i>n</i> = 200	80	75	80	82	75	82	81 <sup>b</sup>
Percent that would "definitely want partner to know" she was using product	Primary partner <i>n</i> = 718	78	79	78	88***	79	88*	83 <sup>a,***</sup>
	Paying partner, woman had injected in the previous 6 months <i>n</i> = 138	40	50	40	27	50	27	41 <sup>c</sup>
	Paying partner, woman had not injected in the previous 6 months <i>n</i> = 203	42	23	42	48	23	48*	43 <sup>c</sup>
Percent that would prefer a product if it were both spermicidal and microbicial.	Primary partner <i>n</i> = 676	85	75*	85	75**	75	75	80 <sup>a,*</sup>
	Paying partner <i>n</i> = 351	88	85	88	90	85	90	88 <sup>a</sup>

Note: White and Black indicate non-Latinas only. Latina may be of any racial group.

<sup>a</sup>Derived from Mantel-Haenszel stratified analysis, controlling for self-reported HIV status and whether subject injected in the previous 6 months.

<sup>b</sup>Derived from Mantel-Haenszel stratified analysis, controlling for whether subject injected in the previous 6 months.

<sup>c</sup>Derived from Mantel-Haenszel stratified analysis, controlling for self-reported HIV status.

\*Statistically significant at the  $p = 0.05$  level.

\*\*Statistically significant at the  $p = 0.01$  level.

\*\*\*Statistically significant at the  $p = 0.001$  level.

*Preference for products with both spermicidal and microbicial effect.* Most women preferred products that would both prevent infection with HIV and STDs and prevent pregnancy. This preference was stronger for use with paying partners (88%) than with primary partners (80%). Racial/ethnic differences were statistically significant for use with primary partners ( $p = 0.01$ ), with Latina women (especially those in San Juan) assigning the most importance to this characteristic (Table 2). Age group was not a confounder of the

race/ethnicity analysis for either primary or paying partners.

*Timing of insertion.* After initially ranking four products based on appearance, feel, and smell, respondents were told that Replens<sup>®</sup> (Warner-Wellcome, Morris Plains, NJ) and Moist Again<sup>®</sup> (Lake Consumer Products, Vernon Hills, IL), both lubricant gels with applicators, could be inserted as long as 15 minutes before sex, that Lubrin<sup>®</sup> (Upsher-Smith, Minneapolis, MN), a suppository,

had to be inserted at least 15 minutes before sex in order to have time to melt, and that the Avert® (Gynotech Laboratories, LLC, Bethesda, MD) sponge could be inserted several hours prior to sex because the active ingredient would have a timed release. After learning this, 14% of the respondents changed their ranking of the products for use with primary partners, and 18% changed their rankings for use with paying partners. The average ranking of the sponge improved significantly for both partner types (mean ranking for primary: before 3.3, after 3.0,  $p = 0.0001$ ; for paying: before 3.1, after 2.7,  $p = 0.0001$ ).

*Effect of negative characteristics on acceptability.* Respondents were informed that safe and effective microbicides may also have undesirable characteristics and were asked to rate the acceptability of such attributes. As shown in Table 3, women said that the following characteristics

were less than acceptable: minor side effects, such as burning or irritation, by far the most negatively perceived characteristics, and inability to douche for several hours after sex (with paying partners).

To identify factors associated with the rating of these characteristics, a series of *t*-tests was performed on demographics and drug use history. After adjusting for ever having used drugs, age (40 and over compared with 18–39), and self-reported HIV status in an ANCOVA, significant differences were found among racial/ethnic groups in the rating of characteristics (Table 3). Latina women rated the following characteristics as less objectionable than women in other groups: leakage before sex, leakage after sex, need for insertion before each intercourse, need for insertion at least 15 minutes before sex, and minor side effects, such as burning or irritation. However, Latina women gave the lowest rating among all groups to an inability to douche for several hours

TABLE 3. ACCEPTABILITY OF SELECTED CHARACTERISTICS OF MICROBICIDE PRODUCTS<sup>a</sup>

Characteristic		Latina/White mean		Latina/Black mean		White/Black mean		Overall mean <sup>b</sup>
"Leaks out of your vagina a small amount before you have sex"	Primary partner <i>n</i> = 709	3.14	2.88*	3.14	2.74***	2.88	2.74	2.93***
	Paying partner <i>n</i> = 350	3.07	2.74*	3.07	2.44***	2.74	2.44	2.83***
"Leaks out of your vagina a small amount after you have sex"	Primary partner, <i>n</i> = 711	3.31	3.18	3.31	3.10**	3.18	3.10	3.20**
	Paying partner <i>n</i> = 350	3.21	2.89*	3.21	2.91*	2.89	2.91	3.07**
"You have to insert 15 minutes before having sex"	Primary partner <i>n</i> = 706	3.12	2.60***	3.12	2.72***	2.60	2.72	2.88***
	Paying partner <i>n</i> = 350	2.91	2.11***	2.91	2.38***	2.11	2.38	2.62***
"You have to insert again before every act of intercourse"	Primary partner <i>n</i> = 704	2.96	2.36***	2.96	2.47***	2.36	2.47	2.67***
	Paying partner <i>n</i> = 348	2.72	2.43	2.72	2.20***	2.43	2.20	2.52***
Causes minor side effects . . ."	Primary partner <i>n</i> = 702	1.47	1.37	1.47	1.12***	1.37	1.12**	1.30***
	Paying partner <i>n</i> = 344	1.49	1.36	1.49	1.12***	1.36	1.12	1.36***
"You can't douche for several hours after having sex . . ."	Primary partner <i>n</i> = 707	2.53	2.85**	2.53	2.67	2.85	2.67	2.63*
	Paying partner <i>n</i> = 346	2.36	2.39	2.36	2.45	2.39	2.45	2.39

Note: White and Black indicate non-Latinas only. Latina may be of any racial group.

<sup>a</sup>1, definitely unacceptable; 4, definitely acceptable.

<sup>b</sup>Adjusted for HIV status, age (18–39, vs. 40 and over), and whether the respondent had injected drugs in the past 6 months (ANCOVA).

\*Statistically significant at the  $p = 0.05$  level.

\*\*Statistically significant at the  $p = 0.01$  level.

\*\*\*Statistically significant at the  $p = 0.001$  level.

after sex with primary partners. This difference is driven by the much more negative views of San Juan women on this characteristic.

#### *Other factors in predicted likelihood of use*

*Experience with similar products.* We asked about women's actual experience with spermicides with formulations and application methods likely to be used for future microbicides (e.g., gel, cream, film, suppository, and sponge). There was a statistically significant relationship between a woman never having used such spermicides and saying that she was "very likely" to use a vaginal microbicide with her primary partner ( $p = 0.001$ ). At the same time, women who had used such spermicides in the last 6 months were more likely to say that they would use microbicides than were those who had used spermicides before the last 6 months, although this difference was not statistically significant.

*Attitudes of partners/fear of violence or abuse.* Twenty percent of HIV-negative women with primary partners said they were concerned that their partners would become violent if they suggested or engaged in risk reduction measures, 22% reported having had intercourse without a condom because they did not feel comfortable asking their partners to use condoms, and 25% reported having had intercourse without a condom because their partners refused to use condoms. Largely the same group of women reported these concerns and related behaviors. However, there were no significant relationships between HIV-negative women's predicted likelihood of microbicide use with primary partners and any of these variables.

A group of women also reported similar issues with paying partners. One third were concerned that their paying partners might react violently if they suggested or engaged in risk reduction measures, 28% said they had intercourse with paying partners without a condom because the partners refused to use condoms, and 22% reported intercourse with paying partners without condoms because they did not feel comfortable requesting condom use. Women's predicted likelihood of microbicide use was inversely related to concern that their paying partners would become violent if they suggested or engaged in risk reduction measures ( $p = 0.045$ ) and to having had inter-

course with paying partners without condoms because they were uncomfortable requesting condom use ( $p = 0.01$ ).

*Level of concern about HIV.* HIV-negative women who were more concerned about HIV than about other problems in their lives were more likely to say that they would use a microbicide with their primary partners than were those who were less concerned about HIV than about other problems ( $p = 0.016$ ).

*Drug use.* The only statistically significant relationship between women's self-reported drug use in the past 6 months and their predicted likelihood of microbicide use was for women who reported smoking crack daily in the past 6 months. This group of women was more likely to say that they would use a microbicide with a primary partner than those who did not smoke crack daily ( $p = 0.047$ ).

## DISCUSSION

This study represented hypothetical product acceptability research and focused on obtaining potential users' perspectives on hypothetical vaginal microbicides.<sup>17,18</sup> Our survey of drug-involved women at high risk for HIV infection confirmed three major themes of the prior focus group and product trial components of the study: (1) drug-involved women's positive attitudes toward microbicides and high predicted likelihood of microbicide use, (2) their favorable response to products providing additional wetness or lubrication, and (3) their inclination for their primary partners to know of their microbicide use. Statistically significant differences in responses by site generally tracked differences by racial/ethnic groups because of the predominance of one group in each site: African Americans in Bridgeport, Caucasians in Providence, and Latinas in San Juan. There were some difference between responses of blacks in Providence and blacks in Bridgeport (e.g., higher predicted likelihood of use in Bridgeport [ $p = 0.03$ ]) but fewer differences between responses of Latinas in San Juan and Bridgeport.

The survey found that drug-involved women had generally very positive attitudes toward hy-

pothetical microbicide products. This is in contrast to the finding from the Guttmacher Institute's survey of a nationally representative sample of women, in which 60% of all respondents said that they were not interested in vaginal microbicides. However, the Guttmacher survey also found that minority women were more likely to be interested in microbicides than whites, which is consistent with our survey results ( $p = 0.001$ ).<sup>19</sup> The lower predicted likelihood of use among Providence respondents, who were predominantly Caucasian, may also be related to the lower background incidence of HIV and AIDS in that city, with perhaps concomitant lower levels of perceived risk. The 1998 AIDS case rate in San Juan was 53.1/100,000, fifth highest among U.S. metropolitan areas with populations of 500,000 or more. Case rates were lower in the New Haven Metropolitan area (which includes Bridgeport [22.1/100,000]) and Providence (13.6/100,000) than the rates both in San Juan and across all metropolitan areas with populations of 500,000 or more (23.0/100,000).<sup>1</sup>

Women's greater predicted likelihood of microbicide use with paying partners than with primary partners is consistent with research showing that women are more likely to use condoms with casual or paying partners than with primary partners.<sup>20,21</sup>

Women's positive attitudes toward microbicides persisted even after they were asked about potentially undesirable product characteristics. After rating a number of these characteristics as unacceptable, the vast majority of women still said that they would be very likely to use microbicides with both primary and paying partners. This is consistent with previous research suggesting that acceptability may not drive actual likelihood of use in the real world, where women must choose among several less than ideal options.<sup>17,22</sup> Women may still be willing to use products that have some undesirable or even "unacceptable" characteristics if such products are shown to be safe and effective against HIV and STDs.

Women generally preferred products that make them wetter than normal or provide additional lubrication during sex, indicating the potential importance of characteristics enhancing sexual pleasure to the actual acceptability and use of products.

One of the most commonly asserted potential

advantages of vaginal microbicides is that women might be able to use them without their partner's knowledge. This could be particularly important to women in abusive relationships where it is difficult to negotiate condom use. However, our survey results suggest that drug-involved women would especially want their primary partners, but not as commonly their paying partners, to know of their microbicide use. African American women were most likely to want their primary and paying partners to know.

There are several possible explanations, not all of them inconsistent with a desire for an unobtrusive product. Women may assume that the first available microbicides will have characteristics, such as leakage, unusual additional lubrication, or odor, that would enable a partner to discern their use without being told. Additionally, some men may discern the presence of a product because they have an allergic reaction to it. Particularly in an abusive relationship, it may be more dangerous for a woman to fail to tell her partner that she is using a product whose presence he might discern anyway than to tell him. A partner may infer from the unexplained presence of a product that the woman has been unfaithful or has an STD.<sup>12</sup> Some women's positive opinions of the sponge that must be inserted several hours before sex could indicate a perception that this product would be less obtrusive to primary partners.

On the other hand, a paying partner may not be as likely to discern the use of a product, because in most cases, he will not be as familiar with the woman's physiology. Additionally, women may not want to get involved in explaining their use of a product to a paying partner. These factors may help to account for the lower percentage of respondents who said that they would want their paying partners to know of their microbicide use.

The inverse relationship between women's expressed likelihood of using microbicides with paying partners and indicators of violence or intimidation in those relationships suggests that abuse may have a strong negative influence on future microbicide use. In some instances, ironically, women may be less likely to use products that are ostensibly designed to help them protect themselves in the context of just such abuse and intimidation. Such factors place these women at even higher risk for HIV and STDs.

Daily crack use, a possible marker for high risk of sexual acquisition of HIV,<sup>23</sup> and being more worried about HIV than other problems were significantly related to predicted likelihood of microbicide use. However, most attributes of drug involvement, including being a sexual partner of an IDU, were not related to predicted likelihood of use. Nevertheless, predicted likelihood of use was high in all subgroups in these analyses.

The study has several limitations. First, as this was not a population-based survey, the results may not be generalizable to the overall population of drug-involved women. The survey targeted women at very high risk for HIV infection, defined by our eligibility criteria.

A second limitation is that the survey gathered data about drug-involved women's hypothetical use of microbicide products. Such data may be considered unreliable without reference to actual experience or behaviors. The product trials component of this study addressed this issue by collecting women's views regarding their actual experience using three lubricant products with formulations and application methods probably similar to those of future vaginal microbicides.<sup>13</sup> The higher predicted likelihood of microbicide use with primary partners among women who had never used such spermicides than among those who had used spermicides may indicate that actual negative experience with a similar product reduces future likelihood of microbicide use. At the same time, the higher predicted likelihood of microbicide use among women who had used spermicides in the last 6 months may mean that this group includes more women who are sufficiently satisfied with these products that they continue to use them, whereas the group who had used spermicides before the last 6 months includes more women who had discontinued use because of adverse experiences or before they learned to use them properly. Currently available spermicides, such as those containing nonoxynol 9, may have side effects, such as burning or irritation, that developers of microbicides should seek to avoid.

Third, because this survey captured HIV status by self-report only, it may have underestimated HIV prevalence among respondents. HIV-positive women in serodiscordant couples may be more inclined to use a microbicide to protect their partners.

## CONCLUSIONS

We believe that developers and evaluators of vaginal microbicides for HIV and STD prevention must understand that actual product use will not be driven simply by the acceptability of a technology or of particular product characteristics. Rather, products and their characteristics must be assessed in the context of the actual relationships and cultural contexts in which the potential users find themselves. Just as these circumstances and contexts differ, a diversity of products will be required to achieve widespread acceptability and use among drug-involved women of all racial and ethnic groups. For example, a less wet product may be more appealing to young women. Moreover, effective programs to provide education about microbicides and encourage use of products will have to include men<sup>24</sup> and address the complex relationship issues identified in our survey and other research. Additional research is needed to explore further the racial and ethnic differences in attitudes toward microbicides as well as to elucidate the influences of partner violence and other relationship issues on the likelihood of high-risk women using microbicide products.

## ACKNOWLEDGMENTS

We thank the interviewers in each of the three sites who collected the data on which this article is based. The Institutional Review Boards of Abt Associates and the organizations collecting the data in the three sites approved the protocol before the survey was fielded.

## REFERENCES

1. Centers for Disease Control and Prevention. HIV/AIDS Surveil Rep 1998;10:14.
2. Heise L, Ellsberg M, Gottemoeller M. Ending violence against women. Population Reports, series L, No. 11. Baltimore: Johns Hopkins University School of Public Health, Population Information Program, December 1999:13.
3. Stein ZA. HIV prevention: The need for methods women can use [Commentary]. *Am J Public Health* 1990;80:460.
4. Stein ZA. HIV prevention: An update on the status of methods women can use [Editorial]. *Am J Public Health* 1993;83:1379.

5. Coggins C, Elias C, Atisook R, et al. A study of women's preferences regarding the formulation of over-the-counter vaginal spermicides. New York: Population Council, 1998.
6. Stephenson J. Intensify vaccine, prevention research. *JAMA* 1998;280:1211.
7. Nathanson N. Harnessing research to control AIDS [Commentary]. *Nat Med* 1998;4:879.
8. Roddy RE, Zekeng L, Ryan KA, Tamoufe U, Weir SS, Wong EI. A controlled trial of nonoxynol 9 film to reduce male-to-female transmission of sexually transmitted diseases. *N Engl J Med* 1998;339:504.
9. VanDamme L. Advances in topical microbicides. Oral presentation WeOr62. XIII International AIDS Conference, Durban, South Africa, July 12, 2000.
10. Murphy ST, Miller LC, Moore J, Clark LF. Preaching to the choir: Preference for female-controlled methods of HIV and sexually transmitted disease prevention. *Am J Public Health* 2000;90:1135.
11. Sussman L, Scarlett M, Heise L, Bentley ME. Integrating biomedical and social science perspectives in microbicide-related research. Poster abstract WePeC4475. XIII International AIDS Conference, Durban, South Africa, July 12, 2000.
12. Mason TH, Foster S, Hammett TM, et al. Factors affecting acceptability of vaginal microbicides among drug-involved women: Results of focus groups in three cities. Manuscript under review, 2000.
13. Hammett TM, Mason TH, Joanis CL, et al. Acceptability of formulations and application methods for vaginal microbicides among drug-involved women: Results of product trials in three cities. *Sex Transm Dis* 2000;27:119.
14. Kleinbaum DG, Kupper LL, Morgenstern H. Epidemiologic research: Principles and quantitative methods. New York: Van Nostrand Reinhold, 1982: 323, 373.
15. Rothman KJ. Modern epidemiology. Boston/Toronto: Little, Brown and Company, 1986:147.
16. Zar JH. Biostatistical analysis, 2nd ed. Englewood Cliffs, NJ: Prentice-Hall, 1984:170.
17. Heise L. Beyond acceptability: Users' perspectives on contraception. London: Reproductive Health Matters, 1997.
18. Elias CJ, Coggins C. Microbicide acceptability research: Where we have been? Where are we going? Presented at conference sponsored by the National Institute of Child Health and Human Development, Washington, DC, October 25, 1999.
19. Darroch JE, Frost JJ. Women's interest in vaginal microbicides. *Fam Plann Perspect* 1999;31:16.
20. Centers for Disease Control and Prevention. Contraceptive method and condom use among women at risk for HIV infection and other sexually transmitted diseases—Selected U.S. sites, 1993–1994. *MMWR* 1996;45:820.
21. Wood MM, Tortu S, Rhodes F, Deren S. Differences in condom behaviors and beliefs among female drug users recruited in two cities. *Women Health* 1998; 27:137.
22. Keller A. Contraceptive acceptability research: Utility and limitations. *Stud Fam Plann* 1979;10:230.
23. Tortu S, Beardsley M, Deren S, et al. HIV infection and patterns of risk among women drug injectors and crack users in low and high sero-prevalence sites. *AIDS Care* 2000;12:65.
24. Blanchard K, Coggins C. Men's attitudes toward a potential vaginal microbicide in Mexico, the U.S., and Zimbabwe. Poster abstract 33141. 12th World AIDS Conference, Geneva, Switzerland, July 1, 1998.

Address reprint requests to:  
*Theodore M. Hammett, Ph.D.*  
*Abt Associates Inc.*  
*55 Wheeler Street*  
*Cambridge, MA 02138-1168*