AIDS and Behavior, Vol. 4, No. 3, 2000

Future HIV Prevention Options for Men Who Have Sex with Men: Intention to Use a Potential Microbicide During Anal Intercourse

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Received Apr. 12, 1999; revised Aug. 31, 1999; accepted Sep. 2, 1999

Development of an effective rectal microbicide holds promise for HIV prevention. This study examined men's personal efficacy standards (i.e., preferences about product efficacy) for a future rectal microbicide and intentions to use it during anal intercourse. Three hundred eighty-five men who have sex with men, sampled in West Hollywood, completed a behavioral questionnaire, read a detailed description of a potential rectal microbicide gel, and expressed their preferences about product efficacy and intended use. On average, participants wanted a microbicide gel to be 84% effective in preventing HIV infection before they would use it as the only means of protection during anal intercourse; 53% of the men wanted the gel to be at least 95% effective. In multivariate analyses, intention to use the gel by itself was associated with higher efficacy standards for the microbicide, negative attitudes about using condoms, and a history of unprotected anal intercourse. Thirty-seven percent of the men who always used a condom during anal sex in the past year said they would be more likely to use a microbicide gel than a condom in the future; however, 85% of this subgroup wanted the gel to offer protection comparable to a condom before they would use it alone. In conclusion, an effective rectal microbicide may have a sizable public health benefit because it provides an alternative for men who dislike condoms.

KEY WORDS: Microbicides; MSM; HIV; AIDS; sexual risk.

INTRODUCTION

Chemical compounds known as microbicides have been shown to inactivate or disable HIV in laboratory studies (Calypool *et al.,* 1998; Harbison and Manner, 1989; Harrison and Chantler, 1998; Pauwels and De Clercq, 1996). The findings have sparked interest in testing whether topical substances (e.g., gels, creams, foams) that contain these chemicals may help protect people from becoming infected with HIV and other sexually transmitted diseases (STD) when used in the vagina or rectum during sexual intercourse (Bergeron *et al.,* 1995, 1996, 1998). Safe and effective products may contribute substantially to STD/HIV prevention; they offer a receptive partner greater control over self-protection, they may be acceptable to men and women who disfavor condoms, and they can be used as a lubricant in conjunction with a condom to increase protection.

Studies have examined the safety, acceptability, and efficacy of topical microbicides for vaginal intercourse. Most of the work has focused on topical substances that contain nonoxynol-9 (N-9), a detergent-based spermicide with potential microbicide properties. N-9 has been found to have minimal toxicity in the vaginal track (Van Damme *et al.,* 1998) and to be efficacious in preventing HIV infection in

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1090-7165/00/0900-0279$18.00/0

women (Wittkowski *et al.,* 1998), although its safety (Stafford *et al.,* 1998) and efficacy (Cook and Rosenberg, 1998; Hira *et al.,* 1997; Roddy *et al.,* 1998) have been called into question by recent findings.

Much less is known about microbicides that could be used rectally by men who have sex with men (MSM) (Taylor, 1998). A survey study found that 41% of seronegative MSM who engaged in anal sex in the past 6 months actively sought lubricants that contained N-9 (Gross *et al.,* 1998). In another survey, 90% of MSM said they would use a lubricant with a microbicide if available (Carballo-Dieguez and Dolezal, 1996). An N-9 product (Advantage 24) has recently undergone a rectal safety trial in MSM (Gross et al., in press), but the efficacy of N-9 or any other product in preventing HIV infection when used by itself during anal intercourse has not been studied.

At this preliminary stage of investigation, it is important to gain an understanding of MSM's preferences about and intentions to use a potential rectal microbicide. One question concerns MSM's preferences about the efficacy of a product: What level of efficacy do MSM want in a topical microbicide before they would use it as their only means of protection during anal intercourse? Some men may have a stringent efficacy standard (e.g., 95% effective), whereas other men may have a less stringent standard (e.g., 50% effective). Each of these two groups of men may be equally likely to use a product that reaches their efficacy standards, even though those standards differ. Another possibility, however, is that men with stringent standards may be somewhat more likely than men with less stringent standards to use a product that reaches their requirements, because risk for infection is still substantial when using a product that is only 50% effective, for example. This leads to a second question: Do MSM's efficacy standards predict how likely the men are to use a microbicide by itself during anal intercourse?

Other issues pertain to the potential public health impact of a microbicide. That impact depends, among other things, on the efficacy of a product to prevent infection, people's inclination to use the product given its level of protection, and the extent to which people may substitute one prevention product or practice for another that has less protective value. For example, condoms are up to 95% effective in blocking HIV and other STDs when used correctly (Pinkerton and Abramson, 1997). If the availability of a new product with less efficacy should reduce the consistency with which men use a condom during anal intercourse, then the incidence of HIV infection may increase. On the other hand, a microbicidal product that is only moderately efficacious may provide an acceptable option for men who disfavor condoms or do not use them regularly. Given that 50% or more of MSM do not always use a condom during anal sex (Gross *et al.,* 1998; Hays *et al.,* 1997; Steiner *et al.,* 1994; Van de Ven *et al.,* 1997; Weatherburn *et al.,* 1991), use of a topical microbicide by these men may result in a substantial public health benefit (Watts *et al.,* 1998). Several research questions arise in this regard: Are MSM who have negative attitudes about using condoms more likely than men with positive attitudes to use a rectal microbicide during anal intercourse? Are MSM who do not always use a condom during anal sex more likely than their counterparts to use a rectal microbicide by itself during anal intercourse? What percentage of MSM may be likely to switch from using a condom to using a microbicide during anal intercourse? And among those who are likely to switch, are the participants' efficacy standards for the microbicide comparable to the protective efficacy of a condom?

In the survey study reported here, sexually active MSM provided data on their attitudes about using condoms, anal intercourse in the past year, and demographic standing. They read a description of a potential microbicidal product formulated as a gel for use in the rectum during anal intercourse and responded to a series of measures that enabled us to examine the preceding questions.

METHOD

Recruitment and Questionnaire Administration

The survey was conducted in 1997 in West Hollywood, California, a gay enclave of Los Angeles County. Recruitment was conducted on Fridays, Saturdays, and Sundays at multiple street locations during morning, afternoon, and evening hours. Research assistants (RA) approached men walking alone or in groups. When a group of men appeared, the man closest in physical proximity to the RA was selected. If an unselected man from the group expressed interest in the study (few cases), he was allowed to participate if he and the selected man were not sexual partners and if he met the following eligibility criteria: English-speaking, White, African American, or Hispanic MSM, between the ages of 18 and 42 years, and had engaged in anal intercourse with a man in the past year. Eligibility was assessed with a brief

self-administered screening questionnaire. Fifty-three percent of the men approached agreed to fill out the screener, of whom 51% were eligible and all agreed to participate. Each participant was queried to make sure that he had not already been enrolled in the study. The men self-administered a 30-min questionnaire while seated in chairs at street locations. No personal identifiers were included. They sealed completed questionnaires in envelopes, deposited them in a collection box, and were paid $15.00.

Measures of Background Characteristics

Participants indicated the total number of men with whom they engaged in anal intercourse (either insertive or receptive with or without a condom) in the past year. Of this total, they reported the number with whom they engaged in unprotected insertive or receptive anal intercourse (UAI) at least once. Sexual risk was operationalized as the percentage of UAI partners. Participants used a 7-point scale (1 = extremely negative; 7 = extremely positive) to indicate how they felt about using a condom to help prevent HIV infection. Demographic variables were assessed with standard response formats, including sexual orientation (''Do you consider yourself gay, bisexual, or heterosexual?'') and self-reported HIV serostatus (seronegative, seropositive, unknown/not tested).

Description of Microbicide Gel, Behavioral Vignettes, and Response Measures

All participants read the following description of a potential microbicidal product:

> Researchers are currently trying to develop a product called a MICROBICIDE that might disable or ''kill'' HIV (the virus that causes AIDS). Although such a product does not yet exist, here's how it would work: The microbicide would be an active ingredient in a gel that could be used in the anus or on the penis. For example, the gel would be inserted in and around the anus and/or on the penis before having anal intercourse. When the gel comes into contact with semen or blood that contains HIV, the microbicide would disable the virus and help prevent infection.

After reading this description, participants responded to two vignettes (order counterbalanced). One vignette asked them to assume that they were going to have anal intercourse with someone they just met and whose HIV serostatus was unknown; the other asked them to assume that they were going to have anal intercourse with someone they knew for 6 months, felt emotionally close to, and whose HIV serostatus was unknown. In each vignette, the participants imagined themselves in two anal intercourse roles, namely, the receptive partner and the insertive partner (order counterbalanced). Thus, each participant responded to four partner/behavior combinations.

After reading each vignette, participants responded to four questions: (1) ''When you are the receptive (insertive) partner with this person, how effective would a microbicide gel have to be in preventing HIV infection before you would use it as your only means of protection?'' The response scale ranged from 0 (never effective) to 100 (always effective). This variable is referred to below as a participant's ''efficacy standard.'' The next three questions had the following preface: ''Assuming that a microbicide gel is as effective as you stated above, and you are the receptive (insertive) partner in anal intercourse with this person, how likely would you be to'' (2) ''use a condom and *not* use a microbicide gel,'' (3) ''use a microbicide gel and *not* use a condom,'' and (4) ''use a condom and a microbicide gel together?'' The response scale for these behavioral intention items ranged from 0 (extremely unlikely) to10 (extremely likely).

Statistical Analyses

Of the 480 MSM recruited, 385 had complete data on all study variables and comprised the analytic sample. The 95 men omitted due to missing data did not differ significantly from the analytic group on any of the demographic, attitudinal, or behavioral variables examined here.

Preliminary analyses indicated that the two vignettes (i.e., casual and emotionally close partners) elicited highly similar responses. Further, there were no appreciable differences due to receptive versus insertive anal intercourse roles and no interaction effects. Accordingly, the responses of each participant were averaged across these factors to create a single score on each response dimension.

Mean scores on the microbicide, attitude, and behavioral measures were compared between demographic subgroups with F tests and t tests. The percentage of men who wanted a microbicide gel to be at least 95% effective against HIV infection before

they would use it as their only source of protection was compared by demographic groups (chi-square). The cut-points for age, annual income, and education (see Table I) assured that an adequate number of participants were included in each subgroup.

To examine potential condom substitution, participants were categorized into one of three sexual risk groups: no UAI partners ($n = 100$), some UAI partners ($n = 212$), and all UAI partners ($n = 73$). Comparisons between these three groups were made with chi-square tests. For each group we computed the percentage of men who said they would be more likely to use a microbicide gel than a condom during anal intercourse (i.e., higher score on the gel-use measure than the condom-use measure, $n = 165$) and the percentage who stated that they were substantially more likely to use a gel than a condom (i.e., score on gel use exceeded the score on condom use by 4 or more scale units, $n = 80$). Among these two groups, we calculated the percentage who wanted the gel to be at least 95% effective against HIV infection.

Least-squares multiple regression analyses tested predictors of how likely participants would be to use a microbicide gel by itself, use a condom by itself, and use both together during anal intercourse. Each dependent variable was examined in a separate analysis. A logistic regression model examined the odds of being more likely to use the gel than a condom ($n = 165$ coded 1 vs. all others coded 0). The equation was the same for each regression analysis. Demographic covariates were identified in preliminary univariate tests. Two participant HIV serostatus variables (HIV-negative as referent [0], HIV-positive [1], and HIV-unknown [1]) and two ethnicity variables (White as referent [0], Hispanic [1], and African American [1]) were included as dummy-coded predictors. The other variables (continuous measures) in the equation were efficacy standard for the microbicide, attitude about condoms, and percentage of UAI partners.

Finally, participants' microbicide efficacy standards were skewed somewhat (i.e., most men expressed a high standard). Therefore, this variable was transformed to reduce the skew and reanalyzed. The findings were highly similar to the results from the original interval measure reported below. Additionally, the percentage of UAI partners tended to correlate inversely, $r = -.11$, $p < .05$, with the number of anal sex partners in the past year. There were no appreciable changes in the results after statistically controlling for number of partners.

Table I. Demographic Characteristics ($N = 385$)

Variable	*n*	%
Age (years)		
18–24	99	25.7
25–30	135	35.1
31–42	151	39.2
Sexual orientation		
Homosexual	343	89.1
Bisexual	41	10.6
Heterosexual	1	0.3
Ethnicity		
African American	92	23.9
Hispanic	110	28.6
White	183	47.5
Education		
Less than college degree	133	34.5
Two-year college degree	53	13.8
Four-year college degree or higher	199	51.7
Annual income ($)		
Below 20,000	100	26.0
20,000–29,999	107	27.8
30,000–39,999	80	20.8
40,000 and above	98	25.5
Self-reported HIV serostatus		
Unknown	55	14.3
HIV-positive	46	11.9
HIV-negative	284	73.8

RESULTS

Demographics, Attitudes About Using Condoms, and Unprotected Anal Intercourse

Table I summarizes the demographic characteristics of the participants. The multiethnic sample was moderately to highly educated with a wide range of income. Median age was 29 years. The sample as a whole expressed a positive attitude toward using a condom to help prevent HIV infection ($M = 5.88$, $SD = 1.38$, range 1–7). Positive attitudes were associated with a smaller percentage of UAI partners ($r = -.12$, $p < .05$). There were no appreciable demographic differences in condom attitudes.

The participants engaged in UAI with an average of 39% of their anal intercourse partners in the past year ($SD = 36\%$, range 0–100). There were two notable demographic differences. Men <25 years of age had a higher percentage of UAI partners (48%) than did men aged 25–30 years (37%) or over 30 years (35%) ($ps < .05$). HIV-positive men had a higher percentage of UAI partners (49%) than did HIV-negative men (37%, $p < .05$), but not men with unknown HIV serostatus (43%). These differences in

risk behavior must be viewed cautiously because we do not have information about the serostatus of the sex partners.

Efficacy Standards for a Microbicide Gel

On average, the participants reported that they wanted a microbicide gel to be 84% ($SD = 23.8$, range 0–100) effective in preventing HIV infection before they would use it as the only means of protection during anal intercourse; 53% of the men wanted a gel to be at least 95% effective before they would use it by itself. Efficacy standards differed significantly by participants' HIV serostatus. HIV-positive men expressed a lower efficacy standard ($M = 71\%$ effective) than did men who were HIV-negative ($M = 85\%$ effective; $p < .05$) or of unknown serostatus ($M = 91\%$ effective; $p < .05$). The same serostatus differences emerged in an analysis of the percentage of men who wanted a gel to be at least 95% effective (HIV-positive men: 26.1%; HIV-negative men: 54.6%, HIV-unknown men: 65.3%; positive men differed $p < .05$ from the other two groups). There were no other demographic differences on the efficacy measure.

Intention to Use a Microbicide Gel, a Condom, or Both

The men said that they would be about as likely to use a microbicide gel by itself (provided that it had the desired efficacy) as they would be to use a condom by itself during anal intercourse (gel alone: $M = 5.29$, $SD = 3.23$, range 0–10; condom alone: $M = 5.40$, $SD = 3.17$, range 0–10, ns). Interestingly, the men said that they would be more likely to use a gel and condom *together* ($M = 7.75$, $SD = 2.76$, range 0–10) than to use either alone ($ps < .05$, dependent-group t test). This preference for ''double protection'' was observed for every demographic subgroup in Table I.

These three intention measures were significantly correlated. Intention to use a gel alone was inversely associated with intention to use a condom alone, $r = -.21$, $p < .05$, and with intention to use a gel and condom together during anal intercourse, $r = -.43$, $p < .01$. Intention to use a condom alone was positively associated with use of gel and condom together, $r = .50$, $p < .01$.

Multiple Regression Analyses

The findings of the least-squares regression analyses are displayed in Table II. The set of demographic, attitudinal, and behavioral predictors accounted for nearly 19% of the variance in participants' intentions to use a microbicide gel by itself during anal intercourse. Both HIV-unknown and HIV-positive participants expressed greater intention than HIV-negative men to use a gel by itself. Intention to use a gel by itself was stronger among participants with high efficacy standards for the microbicide and among men who had a higher percentage of UAI partners, and weaker among men who had positive attitudes about using condoms. The model predicting intention to use a condom by itself during anal intercourse was also significant ($R^2 = 12$). In that model, intention was stronger among Hispanics (than Whites) and among those with positive attitudes about condoms, and weaker among those with high efficacy standards for a microbicide. Percentage of UAI partners was not associated with intention to use a condom by itself. A somewhat different pattern emerged for the model predicting intention to use a gel and condom together ($R^2 = .13$). Intention to use both together was stronger among African Americans (than Whites) and among those with positive attitudes about condoms, and weaker among HIV-positive men (than HIV-negative men) and among men with a higher percentage of UAI partners.

Table III presents the findings of the logistic regression analysis that examined the same set of variables as predictors of the odds of being more likely to use a microbicide gel than a condom. The adjusted odds increased significantly with increases in efficacy standards and increases in the percentage of UAI partners. The odds decreased significantly with increasing positivity of attitudes about condoms. Ethnicity and HIV serostatus were not significant predictors in the logistic model, although the trends were similar to the findings from the least-squares analysis.

Examination of Condom Substitution

Table IV presents data on the issue of condom substitution. A sizable percentage of men said they would be more likely to use a microbicide gel than a condom during anal intercourse. The percentage varied across the three sexual risk groups (Mantel-

Table II. Results of Least-Squares Regression Analyses

Predictor variable[b]	β for dependent measures[a]: How likely to use a microbicide gel and not a condom during anal sex	How likely to use a condom and not a microbicide gel during anal sex	How likely to use a microbicide gel and a condom together during anal sex
Ethnicity (referent group: White)			
African American	−.06	.05	.15**
Hispanic	−.02	.11*	.07
HIV serostatus (referent group: HIV-negative)			
Unknown	.12**	−.02	−.05
HIV-positive	.12*	−.07	−.11*
Efficacy standard for microbicide gel[c]	.33***	−.20***	−.05
Attitude toward using a condom[d]	−.18***	.27***	.27***
Percentage of UAI partners in the past year	.12*	−.02	−.09*
R^2 for total model	.19	.12	.13
F test for total model	12.29***	7.44***	7.87***

[a]β, Standardized regression coefficient.
[b]Predictor variables were entered into the equation simultaneously.
[c]Higher responses on the scale reflect higher efficacy standards.
[d]Higher responses on the scale reflect increasingly positive attitudes.
*$p < .05$; **$p < .01$; ***$p < .001$.

Haenszel chi-square, $p = .07$). Of the 37% of the men who had no UAI partners and said that they would be more likely to use a gel than a condom, 86.5% of them wanted a gel to be at least 95% effective in preventing HIV infection before they would use it by itself. Of the 20% of the men who had no UAI partners and said that they would be substantially more likely to use a gel than a condom, 95% of them wanted a gel to be at least 95% effective in preventing HIV infection before they would use it by itself. Interestingly, among the men who had some or all UAI partners and who were more likely (or substantially more likely) to use a gel than a condom, a significantly smaller percentage (52–67%) of them wanted the gel to be at least 95% effective (see Table IV).

DISCUSSION

Because rectal microbicides are not yet available to the public, the study was confined to asking participants to express their preferences and behavioral in-

Table III. Results of Logistic Regression Analysis

Predictor variable[a]	Odds of being more likely to use a microbicide gel than a condom during anal intercourse: Adjusted odds ratio	95% confidence interval
Ethnicity (referent group: White)		
African American	.86	0.50–1.50
Hispanic	.78	0.46–1.32
HIV serostatus (referent group: HIV-negative)		
Unknown	1.17	0.65–2.56
HIV-positive	1.48	0.63–3.12
Efficacy standard for microbicide gel[b]	1.04***	1.03–1.06
Attitude toward using a condom[c]	.64***	0.57–.83
Percentage of UAI partners in the past year	1.01*	1.001–1.013
R^2 for total model	.17	
χ^2 for total model	71.61***	

[a]Predictor variables were entered into the equation simultaneously.
[b]Higher responses on the scale reflect higher efficacy standards.
[c]Higher responses on the scale reflect increasingly positive attitudes.
*$p < .05$; **$p < .01$; ***$p < .001$.

Table IV. Percentage of Men Who Said They Would Be More Likely to Use a Microbicide Gel Than a Condom During Anal Intercourse, and Their Efficacy Standard, by Sexual Risk Groups

Variable	Men with no UAI partners (n = 100)	Men with some UAI partners (n = 212)	Men with all UAI partners (n = 73)
Percentage who said they would be more likely to use gel than condom[a]	37.0	42.9	50.7
Of those who said they would be more likely to use gel: percentage who wanted gel to be at least 95% effective againt HIV infection	86.5[a] (32/37)	52.8[b] (48/91)	67.6[b] (25/37)
Percentage who said they would be substantially more likely to use gel than condom[b]	20.0	19.8	24.7
Of those who said they would be substantially more likely to use gel: percentage who wanted gel to be at least 95% effective against HIV infection	95.0[a] (19/20)	59.5[b] (25/42)	66.7[b] (12/18)

Note: For each variable, entries with a different superscript differ, $p < .05$ (chi-square); entries without superscripts or with a common superscript do not differ significantly.

[a]Participant's rating of how likely he was to use a microbicide gel by itself exceeded the rating of how likely he was to use a condom by itself.

[b]Participant's rating of how likely he was to use a microbicide gel by itself exceeded by 4 or more scale units the rating of how likely he was to use a condom by itself.

tentions after reading a brief description of a hypothetical product. Caution is thus warranted in using the findings to forecast the behavior of MSM after an actual product becomes available. Further, the study was conducted with an ethnically diverse group of well-educated, self-identified MSM volunteers sampled in West Hollywood, California. The Latino and African American participants may not represent ethnic minorities from poor inner-city locations, and the findings may not generalize to MSM residing in other urban areas or regions of the country. Despite these limitations, the study provides some of the first data on MSM's preferences about and intentions of using a future rectal microbicide gel during anal intercourse. The findings have relevance for understanding the potential public health impact of a future rectal microbicide; they also inform the development, testing, and eventual marketing of microbicidal formulations.

The initial set of research questions pertained to participants' efficacy standards for a rectal microbicide and the association between the standards and how likely participants would be to use a product that met those standards. First, the men wanted the product to be highly effective against HIV infection before they would use it as their only means of protection; about half of the participants wanted the product to offer a level of protection comparable to a condom. Fewer HIV-positive men than other men said they wanted the gel to meet the 95% effectiveness level. This serostatus difference may have stemmed partially from reduced concerns about self-protection among the seropositive men. Second, the participants' efficacy standards for a rectal microbicide predicted intentions to use it as the only means of protection during anal intercourse. That is, compared to men who expressed a high standard for efficacy, those who had a lower standard said they would be less likely to use the product, even if the product reached their efficacy standard. This finding suggests that the men who had less stringent efficacy standards may have recognized the infection risks of using a marginally effective product and thus were somewhat less inclined to say that they would actually use that product.

Other research questions focused on the subgroups of MSM who might be most likely to try a new rectal microbicide during anal intercourse. We found that men with negative attitudes about condoms were more likely than men with positive attitudes to say that they would use a rectal microbicide by itself, provided that it reached their efficacy standard. Similar findings were obtained on the sexual risk measure: as the percentage of UAI partners in the past year increased, participants were increasingly likely to say they would use an acceptably effective microbicide gel by itself. These findings were corroborated in the logistic analysis of the odds of being more likely to use a microbicide than a condom. Other findings are also informative: percentage of UAI partners was higher among HIV-positive and HIV-unknown participants than among HIV-negative participants. Those who were seropositive or of unknown serostatus also expressed greater intent to use a rectal microbicide by itself than did seronegative men. Taken as a whole, these

findings suggest that an effective rectal microbicide may provide a highly acceptable HIV prevention option for the men who need an alternative to condoms to help protect themselves and their partners.

Lastly, research questions concerned the extent to which a rectal microbicide product might lead MSM to lessen the consistency with which they use a condom. Results showed that among participants who said they had no UAI partners (i.e., consistent condom users) in the past year, 37% said they would be more likely to use an acceptable microbicide gel than a condom during anal sex; 20% said they would be substantially more likely to use the gel than a condom. However, a large percentage (85–95%) of participants in these subgroups said that they wanted the gel to be at least 95% effective against HIV infection before they would use it by itself. Thus, although the data suggest that some condom substitution may occur among men who use condoms consistently during anal intercourse, most of the men presumably would switch only when the product offers protection comparable to a condom.

Among participants who had some or all UAI partners in the past year, between 52% and 67% of them wanted the gel to be 95% effective before they would use it by itself. Thus, a sizable percentage of participants who did not always use a condom during anal sex were willing to consider using a product that offered less protection than a condom. The important public health question concerns the number of new HIV infections that may arise from inconsistent use of a product that is up to 95% effective in preventing infection (i.e., a condom) versus the number of new HIV infections that may arise from consistent use of a product that has less protective value (i.e., a potential microbicide). As discussed by Watts *et al.* (1998), a greater level of protection in a population can be obtained by consistent use of a low/moderate-efficacy product than by inconsistent use of a high-efficacy product. Similarly, a greater level of protection can be achieved when a large proportion of a population uses a low/moderate-efficacy product than when a small proportion of people uses a high-efficacy product. This suggests that even a modestly effective microbicide has the potential to reduce the incidence of new HIV infections.

In conclusion, our findings indicate that most MSM have stringent standards for the efficacy of a rectal microbicide and that those standards predict MSM's intentions to use a future product. Men who have negative attitudes toward condoms and use them inconsistently during anal intercourse expressed greater intent to use a rectal microbicide by itself. In addition, many men intended to use a rectal microbicide in combination with a condom. The findings strongly suggest that an effective topical microbicide could have a strong, positive impact on the HIV epidemic. Investigators should vigorously pursue safety and efficacy trials of rectal microbicidal formulations.

ACKNOWLEDGMENTS

We thank Jan Moore for her insightful comments on an earlier draft of this article.

REFERENCES

Bergeron, M. G., Gagne, N., Desormeaux, A., Tremblay, M., Gourde, P., Omar, R., and Beauchamp, D. (1998, June). *Efficacy of a gel formulation to prevent the transmission of pathogens causing sexually transmitted diseases.* Presented at the 12th International Conference on AIDS, Geneva, Switzerland, Abstract No. 33123.

Bergeron, M. G., Gagne, N., Gourde, P., Perron, S., Tremblay, M., Beauchamp, D., Juhasz, J., and Desormeaux, A. (1996, July). *Microbicidal gel to prevent the sexual transmission of HIV.* Presented at the 11th International Conference on AIDS, Vancouver, Canada, Abtract No. We.A.512.

Bergeron, M. G., Gagne, N., Harvie, P., Tremblay, M., Beauchamp, D., Juhasz, J., and Desormeaux, A. (1995, February). *Incorporation of microbicides into a gel formulation to prevent sexual transmission of HIV in women.* Presented at the HIV Infection in Women Conference, Pasadena, California, Abstract No. S48.

Calypool, L. E., Doncel, G. F., Allen, L. B., Keith, K. A., Brazier, A. D., and Buckheit, R. W. (1998, June). *Screening and selection of active anti-agents for the development of vaginal microbicides.* Presented at the 12th International Conference on AIDS, Geneva, Switzerland, Abstract No. 33144.

Carballo-Dieguez, A., and Dolezal, C. (1996, February). *Lubricant use for anal sex in men who have sex with men* (*MSM*). Presented at the Eighth Annual Meeting of the National Cooperative Vaccine Development Groups for AIDS: Conference on Advances in AIDS Vaccine Development, Washington, D.C., Abstract No. 89.

Cook, R. L., and Rosenberg, M. J. (1998). Do spermicides containing nonoxynol-9 prevent sexually transmitted infections? A meta-analysis. *Sexually Transmitted Diseases, 25,* 144–150.

Gross, M., Buchbinder, S. P., Celum, C., Heagerty, P., and Seage, G. R. (1998). Rectal microbicides for U.S. gay men: Are clinical trials needed? Are they feasible? *Sexually Transmitted Diseases, 25,* 296–302.

Gross, M., Celum, C., Tabet, S., Kelly, C. W., Coletti, A. S., and Chesney, M. A. (in press). Acceptability of a bioadhesive nonoxynol-9 gel delivered by an applicator as a rectal microbicide. *Sexually Transmitted Diseases.*

Harbison, M. A., and Manner, S. M. (1989). Inactivation of human immunodeficiency virus by Betadine products and chlorhexidine. *Journal of Acquired Immune Deficiency Syndromes, 2,* 16–20.

Harrison, C., and Chantler, E. (1998). The effect of nonoxynol-9 and chlorhexidine on HIV and sperm *in vitro. International Journal of STD and AIDS, 9,* 92–97.

Hays, R. B., Paul, J., Ekstrand, M., Kegeles, S. M., Stall, R., and Coates, T. J. (1997). Actual versus perceived HIV status, sexual behaviors and predictors of unprotected sex among young gay and bisexual men who identify as HIV-negative, HIV-positive, and untested. *AIDS, 11,* 1495–1502.

Hira, S. K., Feldblum, P. J., Kamanga, J., Mukelabai, G., Weir, S. S., and Thomas, J. C. (1997). Condom and nonoxynol-9 use and the incidence of HIV infection in serodiscordant couples in Zambia. *International Journal of STD and AIDS, 8,* 243–250.

Pauwels, R., and De Clercq, E. (1996). Development of vaginal microbicides for the prevention of heterosexual transmission of HIV. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology, 11,* 211–221.

Pinkerton, S. D., and Abramson, P. R. (1997). Effectiveness of condoms in preventing HIV transmission. *Social Science and Medicine, 44,* 1303–1312.

Roddy, R. E., Aekeng, L., Ryan, K. A., Tamourfe, U., Weir, S. S., and Wong, E. L. (1998). A controlled trial of nonoxynol 9 film to reduce male-to-female transmission of sexually transmitted diseases. *New England Journal of Medicine, 339,* 504–510.

Stafford, M. K., Ward, H., Flanagan, A., Rosenstein, I. J., Taylor-Robinson, D., Smith, J. R., Weber, J., and Kitchen, V. S. (1998). Safety study of nonoxynol-9 as a vaginal microbicide: Evidence of adverse effects. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology, 17,* 327–331.

Steiner, S., Lemke, A. L., and Roffman, R. A. (1994). Risk behavior for HIV transmission among gay men surveyed in Seattle bars. *Public Health Reports, 109,* 563–566.

Taylor, C. (1998, June). *HIV/STD prevention, topical microbicides and rectal sex.* Presented at the 12th International Conference on AIDS, Geneva, Switzerland, Abstract No. 33159.

Van Damme, L., Niruthisard, S., Atisook, R., Boer, K., Dally, L., Laga, M., Lange, J. M., Karam, M., and Perriens, J. H. (1998). Safety evaluation of nonoxynol-9 gel in women at low risk of HIV infection. *AIDS, 12,* 433–437.

Van de Ven, P., Noble, J., Kippax, S., Prestage, G., Crawford, J., Baxter, D., and Cooper, D. (1997). Gay youth and their precautionary sexual behaviors: The Sydney Men and Sexual Health Study. *AIDS Education and Prevention, 9,* 395–410.

Watts, C., Thompson, W., and Heise, L. (1998, June). *The effectiveness of microbicides for HIV prevention.* Presented at the 12th International Conference on AIDS, Geneva, Switzerland, Abstract No. 33161.

Weatherburn, P., Hunt, A. J., Davies, P. M., Coxon, A. P. M., and McManus, T. J. (1991). Condom use in a large cohort of homosexually active men in England and Wales. *AIDS Care, 3,* 31–41.

Wittkowski, K. M., Susser, E., and Dietz, K. (1998). The protective effect of condoms and nonoxynol-9 against HIV infection. *American Journal of Public Health, 88,* 590–596.