Published in final edited form as:
Contraception. 2005 June ; 71(6): 438–442. doi:10.1016/j.contraception.2004.12.023.

Acceptability of five nonoxynol-9 spermicides

Elizabeth G. Raymond[a,*], **Pai Lien Chen**[a], **Sean Condon**[a], **Joanne Luoto**[b], **Kurt T. Barnhart**[c,d], **Mitchell D. Creinin**[e], **Alfred Poindexter**[f], **Livia Wan**[g], **Mark Martens**[h,1], **Robert Schenken**[i], and **Richard Blackwell**[j]

[a] Family Health International, PO Box 13950, Research Triangle Park, NC 27709, USA

[b] National Institute of Child Health and Human Development, Rockville, MD 20892, USA

[c] Department of Obstetrics and Gynecology, University of Pennsylvania Medical Center, Philadelphia, PA 19104, USA

[d] Center for Clinical Epidemiology and Biostatistics, University of Pennsylvania Medical Center, Philadelphia, PA 19104, USA

[e] Department of Obstetrics, Gynecology and Reproductive Sciences, University of Pittsburgh and Magee-Women's Research Institute, University of Pittsburgh, Pittsburgh, PA 15213, USA

[f] Department of Obstetrics and Gynecology, Baylor College of Medicine, Houston, TX 77030, USA

[g] Department of Obstetrics and Gynecology, New York University School of Medicine, New York, NY 10016, USA

[h] Department of Obstetrics and Gynecology, Minneapolis Medical Research Foundation, Hennepin County Medical Center, Minneapolis, MN 55415, USA

[i] Department of Obstetrics and Gynecology, The University of Texas Health Science Center at San Antonio, San Antonio, TX 78229, USA

[j] Department of Obstetrics and Gynecology, University of Alabama at Birmingham, Birmingham, AL 35233, USA

Abstract

Objective—To examine the acceptability of five nonoxynol-9 (N-9) spermicides.

Methods—We analyzed data from a randomized trial of five products, including three gels containing different amounts of N-9 per dose, a film and a suppository. In the trial, 1536 participants were asked to use the assigned spermicide for 7 months and to complete questionnaires 4 weeks after admission and at discontinuation.

Results—Overall, 43% of participants liked their spermicide "very much." This proportion was higher in the three gel groups than in the suppository and film groups. Difficulty with insertion, messiness and discontent with timing of insertion were common complaints in all groups. After adjustment for selected baseline factors, acceptability on the first questionnaire was not related to duration or consistency of subsequent spermicide use or to subsequent time to pregnancy.

Conclusions—In this study, all five spermicides were considered acceptable by most users. Acceptability did not appear to influence spermicide use or pregnancy risk.

*Corresponding author. Tel.: +1 919 405 1460; fax: +1 208 275 6440. eraymond@fhi.org (E.G. Raymond).
[1]Current affiliation: Department of Obstetrics and Gynecology, University of Oklahoma College of Medicine, Tulsa, OK, USA.

Keywords

Spermicide; Randomized trial; Acceptability

1. Introduction

Spermicides are among the least popular of all modern contraceptive methods. In the 2002 National Survey of Family Growth, only about 0.3% of women at risk of pregnancy, or about 128,000 women, reported using spermicides alone to prevent pregnancy (James Trussell, personal communication, March 8, 2005). The limited appeal of this method may in part reflect the lower efficacy of currently available nonoxynol-9 (N-9) preparations compared to other contraceptives, such as oral contraceptive pills, injectables, IUDs and sterilization. Nevertheless, spermicides have substantial advantages over other methods: they are simple to use, have no direct serious side effects, are used only when needed, do not require a prescription and are controlled by women without the need for cooperation of a clinician or male partners. Currently, extensive international efforts are underway to develop new spermicide products that will also be microbicidal and will thus protect women from both unintended pregnancy and sexually transmitted infections (STIs), including HIV infection.

We recently completed a large randomized trial comparing the efficacy and safety of five marketed N-9 spermicides [1]. These spermicides included three gels containing different amounts of N-9 per dose, a film and a suppository. The main findings of the trial were that the lowest dose gel (52 mg N-9) was significantly less effective than the other two gels (100 and 150 mg N-9), but no significant difference in efficacy was apparent between the 100-mg gel, the film and the suppository, which each also contained 100 mg N-9 per dose. The risk of pregnancy associated with all five spermicides was higher than would be expected among users of other modern contraceptive methods. We detected no clinically important safety problems associated with any of the spermicides.

Here we report data comparing the acceptability of these products. We hope that this information will be helpful in the future development of new spermicides, microbicides and other vaginal therapies.

2. Methods

We conducted the trial at 14 sites in the United States between June 1998 and August 2002. The study was approved by the institutional review boards at each site and at Family Health International. All participants signed written informed consent forms before enrollment.

We enrolled 1536 healthy, sexually active women aged 18–40 years who had no history suggestive of subfecundity, who were at low risk for STIs, who stated that they wished to rely on a spermicide as their only contraceptive method for 7 months and who were willing to accept a moderate risk of pregnancy. A full description of trial procedures was published elsewhere [1]; in brief, they were as follows.

After providing eligibility and other baseline data, each participant completed a questionnaire about attitudes toward contraception. She was then randomly assigned to one of the five study spermicide groups. Gels A, B and C contained 52.5, 100 and 150 mg N-9 per dose, respectively, and the film and suppository each contained 100 mg N-9 per dose. Participants were instructed to insert the gels 0–60 min, the suppository 10–60 min and the film 15–60 min before each sex act. The applicators for Gels B and C were identical but different from the applicator for Gel A. Gel group participants were not told which gel they had received. Each participant was

given a supply of her assigned spermicide and a diary on which to record relevant information daily throughout the study. Follow-up visits were scheduled at 4, 17 and 30 weeks after admission. At the 4-week and final visits, each participant completed a seven-page acceptability questionnaire.

The primary measure of acceptability was the participant's response to the question: "In general, how well do you like your spermicide?" Participants were asked to check one of five possible answers: 1=*like it very much*, 2=*like it somewhat*, 3=*dislike it somewhat*, 4=*hate it* and 5=*haven't decided*. In the analysis, we grouped the responses to this question into two categories. Initially, we planned the categories as "acceptable" (answers 1, 2, 5) and "unacceptable" (answers 3, 4). However, after recognizing that only a small proportion of the population gave answer 3 or 4, we changed the groupings to "highly acceptable" (answer 1) or "not highly acceptable" (answers 2–5). Other questions asked about the most and least liked attribute of the spermicide, specific aspects of the spermicide and perceived partner acceptability. For many questions, participants could either choose precoded responses or write in answers. An analyst masked to spermicide group and to frequency of individual responses sorted answers into relevant categories.

We explored the associations between high acceptability and 17 baseline factors: geographic region, age, race, education, marital status, parity, previous spermicide use, desire for additional children, strength of desire to avoid pregnancy now, coital frequency at admission, most important reason for choosing spermicide now and importance of six characteristics of a contraceptive method (efficacy, infection prevention, side effects, acceptability to partner, whether it interrupts sex and whether it is coital-dependent). We found no evidence that any of these variables were highly correlated according to the χ^2 test. In these analyses, we first examined the association between the outcome and each factor separately with a χ^2 test or a Mantel–Haenszel test in all spermicide groups combined. We then included factors related with $p<.10$ in a logistic regression model with spermicide group. The same factor selection procedure was also applied to other regression analyses.

We assessed the association between acceptability on the first questionnaire and the proportion of subsequent coital acts using spermicide with the Wilcoxon rank-sum test. We evaluated relationships between acceptability and subsequent duration of spermicide use and pregnancy with log-rank tests. The association between knowledge of pregnancy and acceptability and the change of acceptability between two acceptability questionnaires were tested with a Cochran–Mantel–Haenszel test and McNemar's test, respectively. We used Fisher's least significant difference approach to compare the proportions of categorical outcomes of interest (e.g., participants who found the spermicide highly acceptable, or those who had specific complaints) separately among the three gel groups and among the three groups using spermicides containing 100 mg of N-9 per dose. If we found a significant result ($p<.05$) in either of these comparisons, we performed pairwise comparisons among the constituent groups.

3. Results

Of the 1536 participants enrolled in the study, 1389 (90%) completed at least one acceptability questionnaire after admission, and 938 (68%) completed two questionnaires. The first questionnaires were completed a median of 30 days after admission. The last questionnaires were completed a median of 211 days after admission and a median of 6 days after the last product use. The median numbers of spermicide uses before the first and last questionnaires were 10 and 33, respectively. These figures were similar among the five spermicide groups, except that in the Gel A group, the last questionnaire was completed somewhat earlier, a median of 190 days after admission.

The 1389 participants who completed at least one questionnaire were approximately evenly divided among the five spermicide groups (273–287 women per group). Their baseline characteristics were similar in the five groups and to those of the primary study analysis population reported earlier [1]. The median age was 27 years. At admission, efficacy, safety and infection prevention were each cited by at least half the participants as "very important" characteristics of a contraceptive method (Table 1). However, less than one-quarter of the participants cited any of these three characteristics as their main reason for choosing a spermicide for contraception at the time of admission.

Of the 1389 women in the analysis population, 592 (43%) overall reported on their last questionnaire that they liked the spermicide "very much," and 552 (40%) liked it "somewhat" (Table 2). This proportion did not differ significantly among the three gel groups, but it was significantly lower in both the film group and the suppository group than in the Gel B group (p=.035 and .0002, respectively). Only 3% of the total population indicated that they hated the spermicide.

At least 40% of women in all groups combined complained of trouble with insertion, timing of insertion and messiness (Table 3). The proportion of participants who reported specific complaints varied among the groups. For example, as compared with women in the Gel B and C groups, women in the Gel A group were significantly more likely to report difficulty with insertion and concerns about efficacy but less likely to complain of side effects. Women in the film group were also significantly more likely than women in the Gel B or suppository groups to report difficulty with insertion and lack of lubrication but less likely to report messiness. Significantly fewer women in the Gel B group than in the film and suppository groups had complaints about timing of insertion with respect to sex (e.g., having to interrupt sex to insert the spermicide or to wait for it to melt/ dissolve), and women in the Gel B group were also less likely to report decreased sexual pleasure. Overall, 20% of women indicated that their partners had some complaint about the spermicide; no significant difference in this measure was found between either the gel groups or the 100-mg groups.

Ten of the 17 baseline characteristics examined were associated with final acceptability (p<. 1) in bivariate analyses. Multivariable analyses including these 10 factors and treatment group showed that women were slightly but significantly more likely to find the spermicide highly acceptable if they were aged 26 or older [adjusted odds ratio (OR) 1.28, 95% confidence limits (CL) 1.01, 1.64] or if they considered STI prevention to be a very important characteristic of a contraceptive method (adjusted OR 1.30, 95% CL 1.01, 1.66). In contrast, women who chose to use a spermicide (or to participate in the study) primarily for financial reasons were substantially less likely to find the spermicide highly acceptable than were women who based their decisions primarily on other factors (adjusted OR 0.30, 95% CL 0.10, 0.86). Notably, acceptability was not significantly associated with prior experience using spermicides, coital frequency at admission, strength of desire to avoid pregnancy now or desire for additional children. Additionally, we found no evidence that acceptability was influenced by participants' beliefs about whether they were pregnant at the time of the final questionnaire; of the 131 women who thought that they were pregnant, 48 (37%) said that the spermicide was highly acceptable, compared with 537 of 1245 women (43%) who did not think they were pregnant (p=.3).

A total of 960 participants (186–201 per group) completed their first acceptability questionnaires before discontinuation of spermicide use—that is, when they completed the questionnaire, they intended to continue using their assigned spermicide as their primary contraceptive. Among these women, the 422 (44%) who indicated high acceptability of their spermicide on that questionnaire subsequently used the spermicide as their primary contraceptive method for significantly longer than other women, although the difference was

trivial (median 183 vs.182 days, p=.04). These 422 women also used the spermicide at a slightly but significantly higher proportion of coital acts (median proportion per participant 100% vs. 98%, p=.04). These relationships were no longer significant when adjusted for baseline factors. Acceptability on the first questionnaire was not significantly related to subsequent time to pregnancy.

In this trial, a total of 635 participants stopped relying on the spermicide earlier than the planned 210 days after admission without having become pregnant. Of these women, only 253 (40%) provided a reason for having done so; most of the rest simply did not return for a discontinuation visit. Among those who gave reasons, 101 (40%) reported a primary reason related to the spermicide, including side effects or other medical events (*n* =37), partner dissatisfaction (*n* =32), messiness, lack of confidence in efficacy and timing of insertion. This proportion did not differ substantially by spermicide group, but those who discontinued for product-related reasons were much less likely than other participants to rate the spermicide as highly acceptable (p<.0001). Of the 1065 women who completed an acceptability questionnaire at discontinuation, 881 (83%) said that they would recommend their assigned spermicide to a friend or relative, although only 352 (33%) said that they would like to continue to use it themselves.

Of the 924 participants who reported acceptability on at least two questionnaires, 17% indicated a higher opinion of the spermicide on the last questionnaire than on the first, whereas 22% showed the opposite pattern (p=.015). This overall decline in acceptability was similar among the three gel groups, but was greater in the film and suppository groups than in the 100-mg gel group.

4. Discussion

All five spermicide products studied in this randomized trial were highly acceptable or acceptable to a substantial proportion of the study population. The gels were more acceptable overall than the film or the suppository, which is welcome news considering that most of the new spermicide and microbicide products currently under development are gels. Difficulty with insertion, messiness and timing of insertion were common complaints among users of all products. The excess frequency of complaints about timing in the film and suppository groups likely reflects the requirement to wait 10–15 min after insertion for these products to melt. Film and suppository users were more likely than gel users to report that the spermicide impaired their enjoyment of sex. The film seemed to be more difficult to insert but less messy than the other products.

Our analyses of participant characteristics associated with acceptability did not find any particular subgroup of women who are especially likely to find spermicides highly acceptable. In our population, acceptability was higher in older women, but no such association was found in a previous study of spermicides conducted largely in developing countries [2]. Notably, although our participants were specifically informed that the contraceptive efficacy of spermicides is poor compared to that of other methods, spermicide acceptability was unrelated to desire to avoid pregnancy or to coital frequency at admission, which is a risk factor for pregnancy. Even more surprisingly, women who thought they were pregnant when they completed the questionnaire were not significantly less likely than other women to find the spermicide highly acceptable. Similarly unexpected was our finding that the spermicides were more acceptable among women who considered STI prevention to be a very important characteristic of a contraceptive method. All participants were counseled at admission and during follow-up that N-9 is not the recommended approach for STI prevention, and our admission criteria excluded women believed to be at high risk for STIs. These findings illustrate

the complexity both of studying women's attitudes and decision-making processes regarding contraception and of the attitudes and processes themselves [3].

Although the suppository and film were significantly less acceptable than the 100-mg gel, our primary efficacy analysis published previously did not show a significant difference in the proportion of women in these three groups who became pregnant [1]. Furthermore, the present analysis did not show any association between acceptability and time to pregnancy on an individual level. A similar result was noted in a previous randomized trial of two spermicides [2]. The interpretation of these findings is not straightforward, as the analysis was observational and we may not have been able to adjust for all of the relevant confounders of any possible association between acceptability and pregnancy. Nevertheless, our results suggest that contrary to accepted wisdom, effective use of these products may not be markedly influenced by moderate differences in acceptability [4]. We conclude that maximizing acceptability should not be a major distraction in the development of urgently needed new spermicides and microbicides.

Acknowledgments

Support for this study was provided by Family Health International (FHI) with funds from the National Institute of Child Health and Human Development (NICHD) contract number N01-HD-7-3271. The views expressed in this article do not necessarily reflect those of FHI or NICHD.

References

1. Raymond EG, Chen PL, Luoto J. Contraceptive effectiveness and safety of five nonoxynol-9 spermicides: a randomized trial. Obstet Gynecol 2004;103:430–9. [PubMed: 14990402]
2. Raymond E, Alvarado G, Ledesma L, et al. Acceptability of two spermicides in five countries. Contraception 1999;60:45–50. [PubMed: 10549452]
3. Severy LJ, Silver SE. Two reasonable people: joint decision-making in contraceptive choice and use. Adv Popul 1993;1:207–27. [PubMed: 12159229]
4. Minnis AM, Shiboski SC, Padian NS. Barrier contraceptive method acceptability and choice are not reliable indicators of use. Sex Transm Dis 2003;30:556–61. [PubMed: 12838083]

Table 1

Attitudes toward contraception at admission

	Participants (*N* =1389)	
	n	**%**
"*Very important*" *characteristics of a contraceptive method*		
Efficacy	1187	85
Safety	911	66
Infection prevention	696	50
Partner satisfaction	616	44
Whether it interrupts sex	535	39
Whether it is coital-dependent	486	35
Most important reason for choosing a spermicide now		
Efficacy	291	21
Safety	226	16
Acceptability	735	53
Financial	67	5

Table 2

Acceptability of five spermicides as reported on last questionnaire

	Gel A (*N* =278)		Gel B (*N* =277)		Gel C (*N* = 287)		Film (*N* = 273)		Suppository (*N* = 274)	
	n	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**
Like it very much	127	46	137	49	124	43	111	41	93	34
Like it somewhat	108	39	102	37	111	39	109	40	122	45
Dislike it somewhat	28	10	19	7	32	11	35	13	35	13
Hate it	5	2	9	3	7	2	11	4	15	5
Haven’t decided/missing	10	4	10	4	13	5	7	3	9	3

Table 3

Proportion of women in each spermicide group reporting specific complaints on last questionnaire

	Gel A (*N* = 278)		Gel B (*N* =277)		Gel C (*N* =287)		Film (*N* =273)		Suppository (*N* = 274)	
	n	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**
Insertion difficulty[a,b]	166	60	111	40	114	40	208	76	115	42
Insufficient lubrication[b]	11	4	6	2	4	1	34	13	5	2
Messiness[c]	122	44	117	42	147	51	62	23	173	63
Timing of application[c]	98	35	107	39	100	35	201	74	165	60
Side effects[a]	55	20	76	27	86	30	60	22	76	28
Efficacy[a]	106	38	81	29	85	30	83	30	79	29
Melt/dissolve[d]	11	4	10	4	10	4	54	20	46	17
Decreased sexual pleasure[d]	24	9	21	8	18	6	39	14	40	15
Partner dissatisfaction	54	19	53	19	57	20	54	20	65	24

[a] Proportions differed significantly (p<.05) among three gel groups; pairwise comparisons showed significant differences (p<.05) between Gel A and both Gel B and Gel C.

[b] Proportions differed significantly (p<.05) among three 100-mg product groups; pairwise comparisons showed significant differences (p<.05) between film and both Gel B and suppository.

[c] Proportions differed significantly (p<.05) among three 100-mg product groups; all three pairwise comparisons showed significant differences (p<.05).

[d] Proportions differed significantly (p<.05) among three 100-mg product groups; pairwise comparisons showed significant differences (p<.05) between Gel B and both film and suppository.