

CERVICAL MUCUS SPERM PENETRATION IN WOMEN
ON ORAL CONTRACEPTION OR WITH AN IUD IN SITU

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ABSTRACT

Penetration of cervical mucus by spermatozoa was observed in cycling and infertile women, in women on sequential or combination oral contraceptive medication, and in women with an IUD in situ.

Sperm penetration of cervical mucus varied from women not using contraceptives and from infertile women, to patients taking sequential conception control pills. In cycling women penetration was low in the early proliferative phase, high at mid-cycle, and low again in the luteal phase. The infertility patients, studied around mid-cycle, had high penetration. Patients on the sequential pill had moderate to high penetration throughout the cycle.

Patients using IUD's had higher than anticipated sperm penetration, especially during the luteal phase of the cycle ($p < 0.05$), but also from Days 11-19, perhaps due to a local effect of the IUD on mucus production.

Patients taking the low dose combination conception control pills had unexpectedly high penetration. During mid-cycle, when ovulation usually occurs, sperm penetration did not differ significantly from that in cycling women.

Accepted for publication February 17, 1971

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INTRODUCTION

Physico-chemical characteristics of cervical mucus vary with the menstrual cycle, depending upon the dominant hormonal stimulus, estrogen or progesterone (1). Mucus, at mid-cycle, just prior to ovulation, under estrogenic stimulation, is thin, watery, and readily penetrable by spermatozoa (2). Ovarian function can be assessed by observation of certain changes in the mucus (3).

Investigators (4-10) have reported decreased or absence of sperm penetration during the entire cycle of women taking the combination type oral contraceptive pill; the hemocytometer technique, the slide and the post-coital tests were employed by the workers cited. Moghissi (8) contended that reduced penetration might protect women from "breakthrough ovulation" when lower doses of oral contraceptives were used. For women on low dosages, Martinez-Manautou *et al.* (7), Roland (9), and Gibor *et al.* (11) occasionally found motile spermatozoa in their mucus. Garcia and Wallach (12) called attention to the inconsistencies of penetration which varies with oral estrogen-progesterone combinations.

We attempted to determine the effect of sequential or combined oral contraception and of the IUD *in situ* on cervical mucus sperm penetration in women.

METHODS

Cervical mucus was obtained in an unselected fashion from student nurses, from women in the infertility clinic, and from women at a Planned Parenthood Clinic during various stages of their menstrual cycle. These women were cycling every 27 to 30 days with an average of 28 days.

The cervical mucus was aspirated from the cervical canal into a plastic syringe through a six-inch, 15 gauge needle and placed at once on a clean glass slide or into plastic storage containers. Mucus, which could not be tested immediately, was frozen at -25° C. and defrosted within a week for examination. Previous unpublished work had demonstrated that sperm penetration tests performed on cervical mucus stored in this fashion for periods greater than 14 days was unreliable, confirming the report of Carlborg (13).

We defined the low dose combination pill as one containing 1.0 mg or less of progestogen and 0.1 mg or less of estrogen per tablet.

The Kremer (14) cervical mucus sperm penetration test, as modified by Fjällbrant (15), was used to evaluate mucus penetration by sperm. Capillary tubes with an inner diameter of 0.04 cm and a length of 5 cm were filled to a height of 4.0 cm with the aid of plastic tubing. A minimum of 10 mg of cervical mucus was necessary to fill one capillary tube. We found that even women on the low dose combination conception control pills had this amount of mucus. If a tube contained air bubbles, it was discarded.

Fresh spermatozoa were obtained from three donors whose counts were consistently above 50 million/ml coupled with a motility above 70 per cent.

Penetration, measured in mm, was classified as "low" at less than 5 mm, "moderate" at 5-24 mm, and "high" at 25 mm or more after 3 hours. The upper limit was set at 30 mm, since this represents the greatest length of the average human endocervix.

RESULTS

Cervical mucus sperm penetration studies were performed on 32 women who used no contraceptive technique, on 55 women from the infertility clinic, on 37 women with an IUD in situ, on 16 women taking the sequential conception control pill, and on 42 women using the low dose combination pill (Table I).

Women using no contraceptives were observed to have low sperm penetration during the early proliferative and the luteal phases of the cycle. Moderate penetration was found to occur from Day 11 to Day 21 in thirteen cases and high penetration in five cases on Days 8, 11, 14, 15, and 25. The single high penetration reading on Day 25 remains to be explained; perhaps the patient had an anovulatory cycle of which we were not aware.

The women from the infertility clinic were tested on cycle Days 11-19 when penetration was expected to be relatively high. The 16 women on sequential conception control pills had higher

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Table I

Cervical Mucus Sperm Penetration Tests

Group	Cycle Day 1-10			Cycle Day 11-19			Cycle Day 20-28			Total
	L	M	H	L	M	H	L	M	H	
Women not using Contraceptive agents	4	-	1	3	11	3	7	2	1	32
Infertile Women	-	-	-	7	19	29	-	-	-	55
Women on the Sequential Pills	2	2	2	1	2	5	-	1	1	16
Women with IUD's <u>in situ</u>	7	4	2	3	6	8	3	1	3	37
Women on Low Dose Combination Pills	7	6	6	5	7	3	3	5	-	42
Total	20	12	11	19	45	48	13	9	5	182

L - less than 5mm penetration
M - penetration from 5-24 mm
H - penetration 25 mm or more

penetration during the late proliferative and early luteal phases of the cycle, as a result of the exogenous estrogen taken from Days 5-20.

When low and combined moderate and high readings were compared, women with an IUD had higher sperm penetration than those women not using contraception during the luteal phase of the cycle. (The Fisher Exact Probability Test was significant at the 0.05 level.)

Patients on the low dose combination conception control pills had 15 low readings scattered throughout the cycle. Moderate penetration was noted 18 times, almost equally divided throughout the cycle. High penetration occurred in 9 patients, on cycle Days 1, 3, 5, 7, 8, 9, 12, 17, and 18. Between Days 8 and 18 (Table II), 13 penetrations were moderate or high and 7 were low. During the time in the cycle when ovulation is most likely to occur, 13 of 20 patients had cervical mucus which was penetrated by spermatozoa. In the group of patients not using contraceptives 13 of 17 readings were in the moderate to high penetration categories. If one focuses on the most fertile period of the cycle, Days 12-16, and applies the Mann-Whitney U Test to the rank-ordered values for sperm penetration, no significant difference was observed between these two groups ($p < 0.2$).

DISCUSSION

The increased penetration seen in women with an IUD in situ may be due to a local effect on cervical mucus production, since the patients studied were using the Lippes loop with string.

Our findings for those women not using contraceptive agents, the women from the infertility clinic, and the women on sequential type oral medication appear to confirm those of previous investigators (2,8). However, patients on the low dose combination conception control pills, although expected to show low sperm penetration throughout the cycle, were observed to have penetration similar to that of women not using contraceptives. Therefore, the chances of an unwanted pregnancy, especially if one pill from the sequence is omitted, are increased. The progesterone content of the low dose pill

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Table II
Sperm Penetration Tests on 17 Women Not Using Contraceptive Agents and 20 Women on the Low Dose Combination Pills from Days 8-18 of the Menstrual Cycle

Cycle Day	8	9	10	11	12	13	14	15	16	17	18	Total
Women not using Contraceptive Agents												
L	-	-	-	-	-	1	2	1	-	-	-	4
M	-	1	1	-	-	-	3	2	1	-	1	9
H	1	-	-	1	-	-	1	1	-	-	-	4
Women on Low Dose Combination Pills												
L	-	-	1	1	2	-	-	2	-	1	-	7
M	-	1	-	-	1	-	4	-	2	-	-	8
H	1	1	-	-	1	-	-	-	-	1	1	5
Total	2	3	2	2	4	1	10	6	3	2	2	37

L - less than 5 mm penetration
M - penetration from 5-24 mm
H - penetration 25 mm or more

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may not be high enough to alter the cervical mucus so that sperm cannot penetrate it. The low dose combination conception control pills did not produce uniformly impenetrable cervical mucus in this survey, and further studies should be performed to verify this finding.

ACKNOWLEDGEMENTS

The authors wish to thank Dr. A. T. Gregoire and Dr. S. Ansbacher for reviewing this manuscript.

This work was supported in part by a grant from the Population Council, New York, New York.

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