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Natural Family Planning: Yesterday, Today, and Tomorrow

John J. Billings

REMARKABLE ADVANCES in our knowledge of reproductive physiology have occurred within the past few decades, such that natural family planning (NFP) is now firmly established on scientific principles. Speculative opinions are progressively being replaced by established fact.

All NFP methods depend upon the extraordinary cyclic activity of the female which determines that phases of fertility are separated by longer phases of infertility. Fertility results from the occurrence of ovulation, and ovulation is the cause of menstruation; in the absence of pregnancy, ovulation will virtually always be followed by menstruation approximately two weeks later. Occasionally multiple ovulations will occur within the one cycle, but these ovulations always occur on the same day, so that there is only one day of ovulation in any cycle.

When our work in Melbourne commenced in 1953, we had only the Rhythm Method available to us. This was based on the shrewd observations of Ogino (made at laparotomy) and those of Knaus (studying uterine contractions following injections of pituitrin) which had demonstrated the time relationship between

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ovulation and the following menstruation, not the menstruation which had preceded it. To convert these contributions to a method of regulating fertility it was necessary to introduce a supposition, which was the weakness of the method. The supposition was that the woman's cycles would remain within the range observed during the previous six to twelve months. The Rhythm Method was therefore made unreliable by irregularity of the cycles, and was inapplicable when ovulation was suspended. Additionally, there were difficulties when bleeding occurred in association with ovulation and was mistaken for true menstruation. The Rhythm Method is essentially a *menstruation method* involving calendar records and the counting of days.

We made a prolonged study of the Temperature Method, recognizing that its weakness is its inability to define days of infertile except after the occurrence of ovulation. Additionally, it is a non-specific indicator which may be disturbed by influences which have nothing to do with the reproductive cycle. When ovulation is suspended it provides no information at all.

In an effort to confront the unsolved problems, we consulted the gynaecological literature and found that more than a century ago there was record of the secretion of a particular kind of mucus from the cervix of the uterus to mark the time of fertility.¹ The laboratory information was definite, but there had been little attention paid to the woman's observation of the mucus so far as the scientific literature was concerned. We were to discover later that knowledge of the significance of the mucus exists in the folklore of some ethnic groups, including some African and Australian aboriginal tribes.² When we encountered uniformly affirmative answers of women regarding their awareness of the symptom, we determined to study it. It soon became evident that the women were describing a characteristic pattern of sequential changes in the sensations produced at the vulva by the presence of mucus and its appearance. With the cooperation of Professor J.B. Brown of the Melbourne University Department of Obstetrics and Gynaecology, we have since 1963 undertaken combined clinical and laboratory studies of virtually every physiological

variation of reproductive activity in the human female as well as multiple pathological conditions. The studies have included the years before menarche and have also extended over many years beyond menopause.

At first we adopted a "multiple index" clinical approach and eventually tested our conclusions by multiple scientific indices which included hormonal monitoring, microscopic examining of ferning and channel formations in the mucus, comparing the examination of mucus obtained from the cervix with the woman's observations at the vulva, and, later, using sonar echography. These multiple indicators led us progressively to the conclusion that the "multiple index" approach in teaching is unsound, creating insecurity in the teacher (concerning all of the natural markers of the phases of the menstrual cycle) and communicating that insecurity to the learning couple. Except in the short fertile cycle, these natural parameters frequently failed to correspond with each other, an observation which led to loss of confidence in all of them, on the part of the couple, and errors in their application.

Our own studies demonstrated that the Peak symptom of the cervical mucus, as defined in Ovulation Method (OM) terminology, is the most reliable biological marker of the time of ovulation, and therefore of post-ovulatory infertility. It is illogical that it be "checked" by a parameter such as the temperature record, which lacks comparable reliability.

Added to that, there was the continuing problem of defining the commencement of the fertile phase. We were able to demonstrate that the mucus pattern reliably points to the commencement of the days of possible fertility—a change from the Basic Infertile Pattern (B.I.P.), again as defined in OM terminology—which corresponds with the first significant rise of oestrogen resulting from follicular ripening within the ovary.

Having progressively determined by practical experience that virtually all women can be taught to recognize their own cervical mucus pattern and interpret it following competent instruction, we concluded that the correct approach in teaching NFP

today is to use the OM as the primary method, reserving other techniques such as the temperature record for temporary use in special circumstances. Because it can enable the woman to recognize the approach of ovulation in sufficient time to avoid pregnancy and know when the possibility of conception in any particular cycle has passed, the OM is therefore applicable in all circumstances, including the premenopause and menopause, which are years of considerable anxiety for many women; we were also able to exploit the usefulness of breast-feeding for both mother and child, and to integrate the natural infertility of breast-feeding into the whole spectrum of NFP. There has been widespread confirmation of our claim that virtually every woman can recognize the indications of infertility and possible fertility provided by observation of the cervical mucus pattern. In the World Health Organization (WHO) trial, 94% of women entering the trial were able to do so within the first cycle after instruction.³ Once the teachers have developed a positive attitude towards the recognition of infertility they will no longer conclude that the woman who does not produce a pattern of fertility has failed to understand; her chart may be typical of infertility.

Some suggest that the readiness with which women who are illiterate or semi-literate, or living in poverty, learn the OM is an indication that they are in some way "closer to nature" than their more sophisticated (although not necessarily more intelligent) sisters living in affluent societies. It is more likely that in their circumstances the teacher has adopted a simpler approach in teaching the method, for it can be said with conviction that teaching which concentrates upon a simple presentation of the facts will produce the best results.

One project involved a study of seven girls for up to 5 years including the onset of their first menstruation.⁴ With the production of cervical mucus associated with higher oestrogen levels, fluctuations in oestrogen level occur before menarche and gradually increase in amplitude. When menstruation begins, it first occurs soon after the oestrogen peak and the presence of the mucus because ovulation is not yet being experienced and the

bleeding is the result of oestrogen withdrawal. As time progresses, progesterone levels begin to rise before menstruation to a level of more than 1.5 mg in 24 hours, this level persisting for up to two weeks as an indication that ovulation has occurred. Now the patches of cervical mucus are separated by longer and longer periods of time from the following menstruation, reflecting the inhibitory effect of the progesterone upon the production of that kind of mucus which leaves the vagina.

The Fertile Phase

In defining the limits of the fertile phase of the cycle one has to take into account the possibilities which exist in regard to sperm and ovum survival. Both animal and human studies have indicated that the survival time of the ovum is unlikely to be more than 12-24 hours after ovulation.⁵ The vagina is ordinarily inhospitable to the sperm cells and they are prevented from entrance even into the cervix of the uterus during most of the cycle. Toward the time of ovulation, glycogen accumulates in the vaginal epithelial cells and is broken down into lactic acid by the lactobacillus of Doderlein, providing a hostile environment for the sperm cells. In the presence of favorable mucus which envelops and nourishes the sperm cells and assists them in finding their way into the cervical crypts and the body of the uterus, the sperm cells may survive—with the ability to fertilize the ovum—for up to 3 days, sometimes a little longer. Unless this particular mucus is present, it is unlikely that the sperm cells will survive for more than an hour or so following ejaculation into the vagina.

The beginning of an increase in sperm survival time is therefore dependent upon and marked by the secretion of mucus which leaves the cervix and becomes evident to the woman. This mucus is formed under the influence of a rising level of circulating oestrogen. The beginning of the fertile phase—that is, the advent of the possibility of fertility—is marked *biochemically* by a significant rise in the oestrogen level and *symptomatically* by the appearance of cervical mucus secretion (or, in the case of the woman who has a continuous secretion, by a change in the characteristics

of the mucus which has already been observed). These two phenomena are interdependent.

In a series of 43 ovulatory cycles, the women recorded the first change from the B.I.P., and it was found that the first mucus change coincided almost exactly with the first oestrogen rise.⁶ In this series the peak of the mucus symptom was shown to be closely related to the time of ovulation.

Another study of 23 normal ovulatory cycles demonstrated a close relationship between the peak levels of FSH and LH in serum and FSH in urine.⁷ The urine LH peak showed a poorer correlation, with multiple peaks in several cycles, probably due to marked fluctuations in serum LH values caused by episodic secretion of the hormone by the pituitary gland. Since all endocrine secretions (except those of the placenta) occur episodically, it is possible that the true serum LH peak occurred the day before it was observed by measurement in some cycles; if this were so it would indicate a close relationship between the oestrogen peak and the serum LH peak. Whether estimated from the time of the oestrogen peak or the LH peak, it was demonstrated that the peak mucus symptom is very closely related to the time of ovulation, and none of the biochemical markers proved to be more accurate than the peak symptom as recorded by the woman.

During *lactation* the levels of oestrogen and progesterone remain low for some time, the duration of infertility being related to the suckling frequency and the time the infant is nourished entirely by breast milk. The absence of ovulation accompanies a high level of circulating prolactin, and there has been a theory that prolactin prevents the ovarian response to the pituitary gonadotropin FSH. The studies of Professor Brown indicate that, more likely, prolactin prevents the FSH rising to a level sufficient to cause ovulation; in other words, the effect of prolactin is primarily upon the hypothalamic-pituitary mechanism.

As lactation continues, the ovaries may show minimal cyclical activity which gradually increases so that cervical mucus is produced at times of raised oestrogen and bleeding sometimes results when the oestrogen levels fall again. With the return of ovulation,

the luteal phase of the initial cycles may be shorter than normal, but the longer the interval between the birth of the child and the return of ovulation the more likely it is that the first ovulatory cycle will exhibit a luteal phase of normal length.

In women approaching *menopause*, the only cause of diminished fertility may be a reduction in the amount of mucus being produced by the cervix, observed in many cases years before the cessation of ovulation and more years before the menopause itself. For some years after the last menstruation, cyclical fluctuations in the oestrogen levels continue. In some women approaching menopause, anovulatory cycles are observed in which there are very high levels of circulating oestrogen, unaccompanied by significant secretion of cervical mucus; the explanation for this phenomenon is not known, but it may indicate a target-organ failure.

In another study of 61 ovulatory cycles, the urinary oestrogen and progesterone (pregnanediol) values were measured.⁸ In all of the cycles in which sufficient information was obtained, there was a clear transition from early baseline oestrogen values which in the majority (91%) fluctuated between 4 and 14 ug/24 hours; in the remaining cycles the baseline values fluctuated between 11 and 22 ug/24 hours. The pregnanediol values reached their lowest levels between 7 days and 1 day before the oestrogen peak, after which the values began to rise. The first significant pregnanediol rise occurred on the first day in which the values were clearly above the follicular phase baseline and exceeded 0.6 mg/24 hours. This series indicated that a pregnanediol level above 1.5 mg/24 hours could indicate post-ovulatory infertility, particularly when the blocking effect of the cervical mucus, formed under the influence of progesterone, is taken into account.

"Do-It-Yourself Kit"

The development of a simple test, a "Do-It-Yourself Kit," was a logical progression of these scientific studies verifying the accuracy of the OM. The results mentioned indicate that, in such a kit, the oestrogen level could be set at 15 ug/24 hours to mark the beginning of the fertile phase and the pregnanediol level just

above 1.5 mg to indicate the end of the fertile phase.

Professor Brown has led the world in the development of such a kit, which in clinical trials has already proved satisfactory for the measurement of urinary pregnanediol in an overnight specimen of urine. Later the kit will be expanded in scope to also measure the oestrogen levels in an overnight specimen and adapted to reflect the ratio of the two hormones to each other.

The fully developed kit will be a landmark in the history of NFP and certainly a brilliant scientific achievement. It will be of great practical value in obstetrical and gynaecological practice, and very useful in NFP if used prudently. Eventually it will find its place in NFP when it is recognized as not "a method" but essentially a refined teaching aid which will help the woman to develop confidence in her own observations. The chemical measurements *will not be more accurate, or even as accurate* as the interpretations made by the woman of her own mucus pattern following competent instruction. As most women will prefer to be guided by observations of natural phenomena than the use of technological aid, it should be made clear to the learning woman that, if she takes the trouble to learn the method properly (preferably by keeping a daily chart for at least several cycles), she will learn to be more accurate than any technology can hope to be.

Examples of the results obtained by use of the test kit (for progesterone) are seen in the following tables. The woman has recorded her estimate of the day of the peak symptom and the day on which the test kit indicated that ovulation had taken place within the past few days. There have also been *laboratory* measurements of the total oestrogen level (TE) and pregnanediol Pd (GLC) in the urine as well as a *quantitative* laboratory measurement of pregnanediol in the urine provided by the kit (PdG). In the second cycle the woman was a little uncertain as to whether or not she had marked the peak a day early.

Another example (table 2) is that of a woman who was anxious to become pregnant and did so following an act of coitus on each of the first two days past the peak of the mucus symptom. As is usual in our research studies of particular cycles, a daily tem-

perature record was kept, but the woman gave up taking her temperature when she was sure from her symptoms that she had ovulated; neither the test kit nor the temperature had yet indicated that this was so. This woman and her husband were particularly anxious for a boy, and had planned the act of coitus accordingly. The child proved to be a boy.

CYCLE 1.	MUCUS	+	+	PEAK	-	-	-
	TE	67	80	65	67	45	32
	Pd (GLC)	.1	.2	.4	.9	2.1	3.5
	PdG (EIA)	.2	.2	.2	.7	1.4	2.8
	KIT	-	-	-	-	+	+
CYCLE 2.	MUCUS	+	+	PEAK		-	
	PdG	.3	.7	1.2	1.8	4.8	
	KIT	-	-	±	+	+	
CYCLE 3.	MUCUS	+	+	PEAK	-	-	
	PdG	.1	.3	.2	1.6	1.9	
	KIT	-	-	-	+	+	

MUCUS	+	PEAK	(I)	(I)	-	
PdG	.1	.2	.4	.4	1.3	PREGNANT
KIT	-	-	-	-	+	
TEMP (c)	36.5	36.6	36.4	36.5		

If further estimates of the usefulness of the OM in determining the sex of the child are to be made, it is important to remember that the timing of coitus is made entirely on the basis of correct observation of the day of the peak symptom, *not* an estimate of the day of ovulation made by reference to other parameters as well. The use of multiple indices introduces errors and vitiates the reliability of the technique.

Most teaching now makes it clear that the day of the maximum quantity of mucus often precedes the peak by a day or two. However, some women are still marking the peak incorrectly as the day of the greatest stringiness of the mucus; the stringiness may disappear but the slippery sensation of the mucus at the vulva persists. The day of the peak is the last day of the lubricative feeling at the vulva.

The words *lubricative* ("slippery") and *lubricity* ("ready to love" or, in its pejorative sense, "lewdness") have the common latin origin *lubricus* ("smooth or slippery"); this is yet another indication of the fact that the most reliable indicator at the time of maximum fertility was recognized in ancient times.

When the application of the test kit is looked at closely in particular circumstances, one can see how the woman could be confused by the test if she did not know the OM well and if she were using the test as a crutch to bolster her lack of confidence or make up for incompetent instruction. Thus a woman close to menopause could encounter difficulty in those circumstances when very high oestrogen levels are associated with infertility, occurring as they may some considerable time away from ovulation and sometimes being unaccompanied by any mucus secretion; the absence of mucus would demonstrate infertility while the test would not. The OM will also identify the "infertile ovulation," that is, infertility due to absence of normal mucus at ovulation; the test would not only fail to identify this infertility but would create unnecessary anxiety.

In the case of the woman who is not yet experienced in the OM and perhaps is approaching menopause with long irregular cycles, the test could distinguish between bleeding due to fluctuating levels of oestrogen and bleeding associated with ovulation which could obscure any accompanying mucus pattern. In the presence of a long cycle, the mucus patches which reflect the transient rise in oestrogen level could be identified for what they are. We have sometimes made temporary use of a temperature record for these purposes and to establish the occurrence of ovulation when a woman having difficulty in achieving pregnancy

reports a too meagre symptom and sophisticated techniques of hormonal measurement are not available. The test kit could clearly provide a more reliable answer to these problems and then (as in the case of the thermometer) be put aside.

In the use of clomiphene for the treatment of infertility due to absence of ovulation, the gynaecologist could check with the test kit to see whether the dosage has been successful in provoking ovulation. In this case, the woman is likely to have been unfamiliar with the mucus pattern of ovulation, and there is also the problem that clomiphene, through its anti-oestrogenic effect, reduces the cervical mucus secretion even when it does cause the woman to ovulate.

Conclusion

Widespread and prevalent use of any birth regulating methods will be maintained only by techniques which are simple, reliable, harmless, economical, and readily available, and which recognize natural sensitivities. It is considered that special tests of the physical properties of cervical mucus, chemical saliva tests, measurements of ovarian blood flow by intra-vaginal thermistors, examination of the cervix, laparoscopy, and echosonography are unlikely to fulfill the required criteria. Chemical tests of the cervical mucus have so far proved disappointing, but offer a field for continuing research.

The present situation is that NFP is established on a sound scientific basis. It has been proved that women understand it easily, that it can be taught in a simple way virtually from woman to woman, and applied in any circumstances which the woman and her husband may encounter; moreover, the husband and wife can be assured that in using this information they will find that it provides a solution which at the same time helps them grow in mutual understanding and generosity. In other words it will foster the development of those virtues upon which the security and happiness of marriage depend. So, as we look together at the future of fertility regulation, we can say with confidence that it is in our hands.

Notes

- 1 J. M. Sims, "Illustration of the Value of the Microscope in the Treatment of the Sterile Condition," *Br. Med. J.* 2, 465-6, (1868), 492-4.
- 2 E. L. Billings and Ann Westmore, *The Billings Method*, (Melbourne: Anne O'Donovan, 1980), p. 13.
- 3 World Health Organization (1981), "A Prospective Multicentre Trial of the Ovulation Method of Natural Family Planning. 1. The Teaching Phase," *Fertil. Steril.*, 36, 152-8.
- 4 J. B. Brown, P. Harrisson, M. A. Smith, and H. G. Burger, "Correlations between the Mucus Symptoms and the Hormonal Markers of Fertility throughout Reproductive Life," *Ovulation Method Research and Reference Centre of Australia*, Melbourne, (1982). Also printed as Appendix 1 to *The Ovulation Method* by J. J. Billings, 7th Edition, (Melbourne: The Advocate Press, 1983).
- 5 L. B. Shettles, "Fertilization and Early Development from the Inner Cell Mass," *Scientific Foundations of Obstetrics & Gynecology*, edited by E. E. Philipp, J. Barnes and M. Newton, (London: William Heinemann, 1970).
- 6 Brown, et al., "Correlations between Mucus and Hormonal Markers."
- 7 *Ibid.*
- 8 *Ibid.*