

# SCIENTIFIC BASES OF FERTILITY AWARENESS

ANA DIREITO

Laboratoire Biostatistique-Santé Université de Lyon, France

**Key words:** *fertility awareness, cervical mucus, basal body temperature, unintended pregnancy rate.*

## Summary

*Fertility awareness methods of family planning are based on the scientific knowledge about the woman's menstrual cycle and the fact that a woman can easily identify the signs of her fertility, mainly the changes in vulvar observations of cervical mucus, the basal body temperature shift and changes occurring in the cervix. The couple can then choose to adapt their sexual behavior to their intention of avoiding or achieving pregnancy. The Billings Ovulation Method, the Creighton Model System and Two Day method are based in the observation of cervical mucus. The Symptothermal method combines the detection of the basal body temperature shift with mucus observation and sometimes palpation of the cervix. Contrarily to a widespread idea, recent fertility awareness based methods of family planning have effectiveness comparable to those of contraception. In a year of use, the unintended pregnancy rate is 0,5-5% for perfect use and 3-20% for typical use.*

## INTRODUCTION

Fertility awareness methods of family planning are based on the scientific knowledge about the woman's menstrual cycle and the fact that a woman can identify the signs of her fertility, but physicians are usually unaware of how these methods work and about their effectiveness in family planning. The aim of this article is to synthetically present the science behind fertility awareness methods of family planning, the different methods available and their effectiveness, so that physicians are better able to inform couples in their choices concerning family planning.

The World Health Organization (W.H.O.) defined Natural Family Planning as "Methods for planning and preventing pregnancies by observation of the naturally occurring signs and symptoms of the fertile and infertile phases of the menstrual cycle. It is implicit in the definition of natural family planning when used to avoid conception, that (a) drugs, devices and surgical procedures

are not used; (b) there is abstinence from sexual intercourse during the fertile phase of the menstrual cycle, and (c) the act of sexual intercourse, when occurring, is complete" [1,2]. This definition implies that the woman can learn to identify the days of fertility in her cycle and that the couple chooses to adapt their sexual behavior to their intention of avoiding or achieving pregnancy.

Some of these methods have also been designed to also be used by couples trying to achieve pregnancy, whether they are normally fertile or dealing with sub fertility [3,4]. We excluded from our analysis methods of family planning based only on calculations, not on observations, because the natural variations in the length of the menstrual cycle make them far less effective.

**The aim of** this article is to give physicians an up to date presentation of basic scientific knowledge behind fertility awareness methods of natural family planning, the different methods existing and their effectiveness in order to give better advice to patients seeking information about family planning.

## THE OBJECT AND METHODS

The object of work: scientific bases of fertility awareness methods. The methods of work: the theoretical analysis of scientific literature and the sources.

### Basic physiology relevant to fertility awareness.

Men have a constant fertility from adolescence and throughout their adult life. Spermatozoa are produced continuously and the cycle differentiation from sperm stem cells and maturation takes about 72 days. More than 100 000 spermatozoa are present in the ejaculate. Sperm survives only for a few hours in women's vagina, but in the presence of mucus of good quality produced by cervical glands, it can survive for up to 5 to 7 days.

Women have a cyclic fertility from menarche to menopause. The primordial follicles are present since intra-uterine life. Women's cycle is under the control of the hypothalamic-pituitary axis and the secretion of gonadotrophin releasing hormone, luteinizing hormone and follicle stimulating hormone. The cycle starts with menstruation. At the beginning of an ovulatory cycle, some of these follicles develop a liquid filled cavity, and one of them becomes dominant and then a mature (Graffian) follicle of about 20 millimeters of diameter,

that ruptures at ovulation. The theca cells in the periphery of the follicle produce estrogens. An estrogen peak takes place about 24h before ovulation. The ovum is then released and lives up to 24 hours: during this time fecundation can take place.

After ovulation, what remains of the follicle becomes the *corpus luteum*, which produces estrogens and progesterone. There is usually only one ovulation per cycle, but exceptionally two ovulations within a 24h time frame can happen, which accounts for heterozygote twins.

In human species, there is no reflex ovulation, unlike in other species where intercourse can induce ovulation. The pre-ovulatory phase of the cycle is variable in length whereas the post-ovulatory phase has a stable length of about 14 days. Therefore methods based solely on calculations are unreliable methods of family planning.

Three elements are important in determining the couple's fertility: (a) the prediction of the day of ovulation and its lifespan, (b) the survival of spermatozoa in women's genital tract in the presence of good mucus and (c) the fact that, after ovulation has occurred, no other ovulation can happen before the next cycle.

Three signs can help the couple to identify the fertile days of the cycle: the presence of cervical mucus, the raise of basal body temperature after ovulation and the changes in position and consistency of the cervix.

**The mucus sign.** The work of researchers and in special of Professor Erik Odeblad [5, 7] contributed greatly to understand the role of cervical mucus in fertility. Cervical mucus consists essentially of two parts: an aqueous solution and the mucin which are glycoproteins forming a three dimensional network. Different types of mucus are present in variable amounts throughout the cycle. Mucus can be characterised in different ways, such as viscosity, colour, stretchiness (strings), and crystallisation, ability to block or conduct sperm. Mucus G (gestagenic) forms a plug during infertile days and is produced in greater amount when estrogens are low and progesterone is high. Different types of mucus are stimulated by

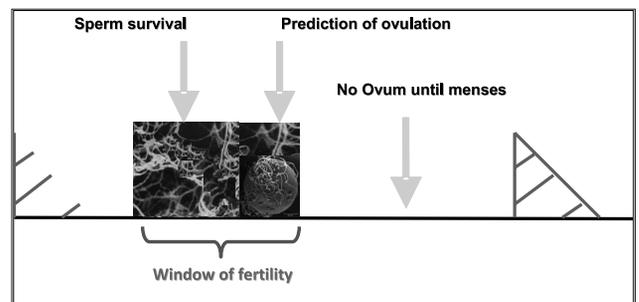


Fig 2: The three determinants of fertility awareness methods of natural family planning.

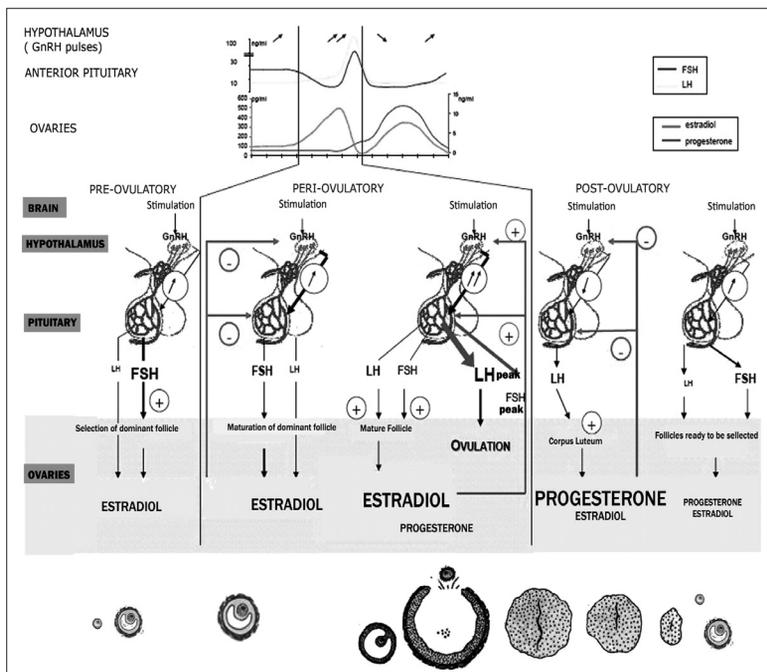


Fig.1: The hypothalamo-pituitary axis and the regulation of the menstrual cycle.

estrogens: L, (locked in) attracts malformed sperm, S(sperm transmission) facilitates the forward movement of sperm cells and P (Peak) present around the time of ovulation is subdivided in Pa with mucolytic activity, associated with Z secretions; P6 facilitates the conduction of sperm. P mucus gives the slippery sensation. F mucus is a substance of composite origin. Z cells in the isthmus of the cervix produce Z substance, with mucolytic enzymes.

Women can learn to observe the quality and quantity of mucus present at the vagina throughout the cycle. During the days preceding ovulation, the mucus changes from a thick opaque secretion to a crystal clear, stretchy slippery. After ovulation, the raise of progesterone and the lower level of estrogens dry up the mucus which becomes thick and opaque or dry again. The quality of cervical mucus is a good predictor of ovulation. The Peak Day is defined as the last day that mucus with more-fertile

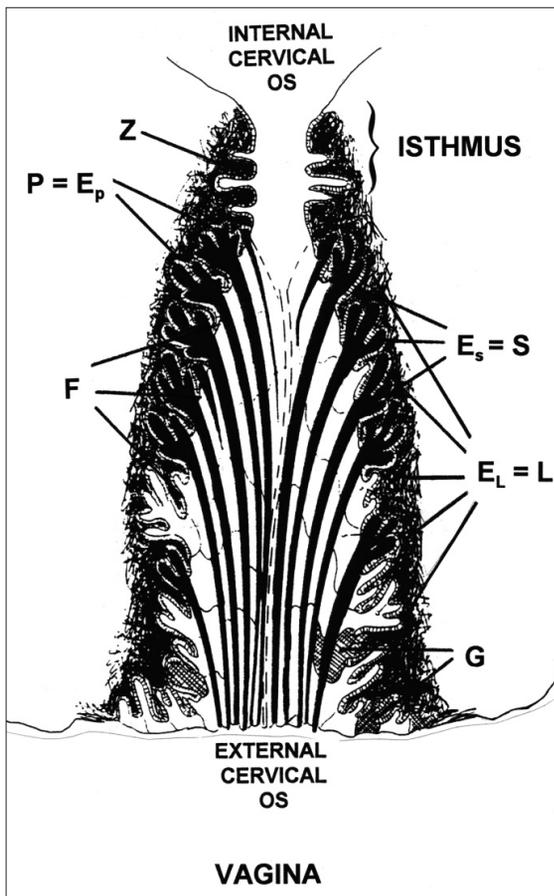


Fig.3 : Schemata of the cervical canal showing the location of S, L, P, G, F crypts and the isthmus with the Z granules. Adapted from Odeblad 1977 and 1994.

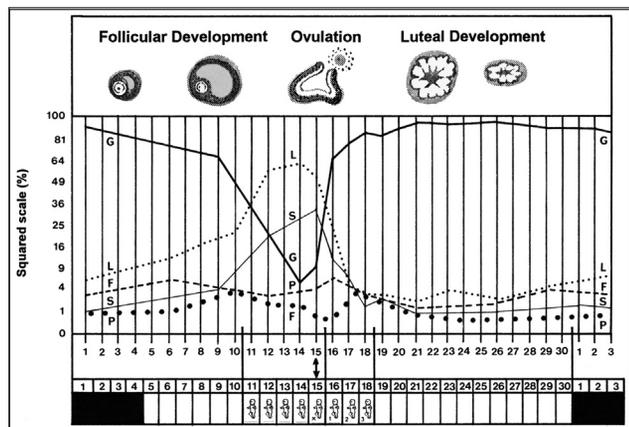


Fig. 4: The percentages of mucus subtypes during the cycle. Cycle from a 15 year old high school girl charting with BOM. The relative amounts of S, L, G, P, and F are shown, as well as the day of ovulation. The peak day is marked with an «X». (adapted from Pr Odeblad).

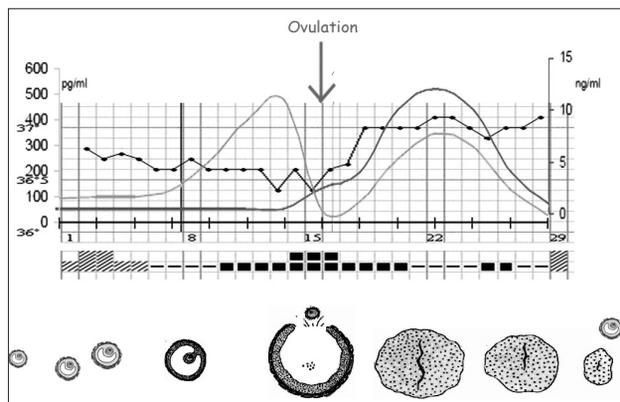


Fig. 5 : The relationship between the basal body temperature, the day of ovulation as determined by ultrasound and estrone and progesterone levels.

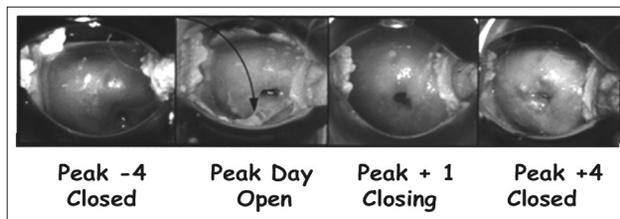


Fig. 6: Changes in the cervix around ovulation. Image from Hilgers TW : The Medical & Surgical Practice of NaProTechnology. Pope Paul VI Institute Press, Omaha, NE, 2004.

Table 1: Comparison of the effectiveness of different fertility awareness methods of family planning.

	Unintended Pregnancies with Natural Methods Number of pregnancies per 100 women per year of use	
	Perfect Use %	Typical Use %
Billings Ovulation Method <sup>3, 11</sup>	0.5	15-20
Creighton Model <sup>12</sup>	0.5	3.2
Two Day Method <sup>13</sup>	3.5	13.7
Temperature method (post-ovulatory) <sup>7</sup>	1	-
Symptothermal Method <sup>15</sup>	0.4-2.3	7-20
Lactational Amenorrhea Method <sup>17</sup>	0.5 - 1.5*	2*

\*6 month life table

characteristics and coincides with the day of ovulation in more than 80% of cases. It is the day of maximum fertility [3,6].

**The basal body temperature.** The secretion of progesterone after ovulation as a thermal effect and raises the basal body temperature by 0,2 to 0,4°C. Temperature should be taken precisely, before bed rise, at the same

hour every day, using the same thermometer every day. A biphasic temperature graph affirms an ovulatory event took place and a subsequent corpus luteum was formed. It does not tell the quality of the corpus luteum and is not the most precise indicator of the day of ovulation. After the temperature has risen, no new ovulation can occur in that cycle. A woman is infertile from the third day of high temperature until her next menstrual period. Because the raise of temperature can occur either rapidly or progressively, it is a less precise way to identify the day of ovulation, but is very accurate in affirming post-ovulatory infertility [8,9].

**The cervix.** Cyclical changes occur in the position and consistency of the cervix, from a closed and lower position and a firm consistency during the infertile days, to a higher position, wet and open to admit a fingertip and a softer consistency at the moment of ovulation. This can be used as an accessory sign to help identify the window of fertility always in combination with other signs [10].

**The different methods of NFP.** The different methods of natural family planning are based on the observation of one or more of the different signs.

Mucus- based only methods are:

- The Billings Ovulation Method. It is the oldest mucus only method and can be used to achieve or avoid pregnancy, developed by Drs J and L Billings [3,11].
- The Creighton Model System is a standardized modification of the Billings Method. Can specially be used by infertile couples in combination with a restorative reproductive technology called Natural Procreative Technology or Naprotechnology, developed by Pr T Hilgers [12].
- The Two Days Method is a more recent mucus only method developed by Georgetown University, based in the presence or absence of cervical mucus in the present and previous day [13].

The methods based on the observation of the basal body temperature, alone or in combination with other signs are:

- The Temperature method [7]: this older method detects post-ovulatory infertility only; Therefore the all the pre-ovulatory phase is considered as fertile and the duration of abstinence is longer than with other methods.
- Symptothermal Methods associate the detection of the basal body temperature shift to detect post-ovulatory infertility and the one or more other signs (mucus, position and consistency of the cervix, and sometimes a calculation) to identify the beginning of the fertile window. Different national organizations promote and train couples to use the Symptothermal method, like CLER in France, Couple to Couple League in United States, Serena

in Canada. The Symptothermal Double-Check Method uses two indicators Cervical Mucus and the Calendar Rule to define the beginning of the fertile phase [14,15].

In recent years, computerized fertility monitors have been developed to help couples seeking a more technical approach to determine their natural fertility. These devices detect either basal body temperature associated with a calculation of the beginning of fertile phase (Bioself 2000. Ladycomp, Cyclotest 2 plus) or read urinary tests detecting metabolites of LH and estrogens (Persona) or estrogens and progesterone (Brown ovarian monitor) [16].

The Lactational Amenorrhea Method is not based on observations but is also a fertility awareness based method of family for exclusive breast feeders. Women totally breastfeeding, which meet certain criteria, can consider themselves infertile until six months postpartum. If (a) the baby is less than six months old; (b) the baby is exclusively breastfed at least every four hours by day and every six hours by night; (c) the mother has not observed the return of menstruation. Once the any of these criteria are no longer met, the women should use another method of family planning [17].

**Effectiveness of FABM of NFP.** Most recent studies on the effectiveness of fertility awareness based methods of family planning report unintended pregnancy rates as perfect use (pregnancies linked to the failure of the method when the aim of the couple was to avoid pregnancy) and typical use (includes pregnancies due to a lack of proper instruction or proper use of the method) [2].

Since these methods are reversible at every stage and do not alter the woman's fertility, the couple can change their intention from avoiding to achieving pregnancy at any moment of the cycle: these pregnancies are reported in some studies as achieving related pregnancies.

Table 1 reports the perfect use and typical use unintended pregnancy rates of different fertility awareness based methods of family planning.

## CONCLUSION

1. Fertility awareness methods of natural family planning are based on solid scientific research. They are perfectly reversible, have no effects on later fertility. Different reliable methods exist, so the couple can choose the method that fits better to their lifestyle and personal preferences. Their perfect use effectiveness is comparable to that of other methods of family planning [2, 15].

2. The gap between perfect and typical use highlights the importance of following training with properly formed instructors. Dialogue between spouses as to their intentions to achieve or avoid pregnancy and mutual

cooperation to live the abstinence during fertile days for a couple whose intention is to avoid pregnancy is also necessary.

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#### MOKSLINIAI VAISINGUMO PAŽINIMO PAGRINDAI

Ana Direito

*Raktažodžiai: vaisingumo pažinimas, gimdos kaklelio gleivės, bazinė kūno temperatūra, neplanuotų nėštumų dažnis*

Santrauka

*Vaisingumo pažinimo metodai, planuojant šeimą, yra paremti mokslinėmis žiniomis apie moters menstruacinį ciklą, taip pat, jog ji pati lengvai gali pažinti savo vaisingumo požymius: gimdos kaklelio ir jo gleivių pokyčius, bazinės kūno temperatūros kitimus. Pažindama savo vaisingumą pora gali reguliuoti lytinį gyvenimą pagal savo poreikius tiek siekiant pastoti, tiek norint atidėti nėštumą. Billingso ovuliacinis metodas, Kreitono modelio sistema ir Dviejų dienų metodas yra paremti gimdos kaklelio gleivių stebėjimais. Simptoterminis metodas apjungia bazinės kūno temperatūros kitimų vertinimą su gimdos kaklelio gleivių pokyčių stebėjimais ir kartais gimdos kaklelio palpacija. Priešingai nei yra plačiai paplitusi nuomonė, vaisingumo pažinimu paremtas šeimos planavimo efektyvumas siekiant atidėti nėštumą ar visai nebepastoti, gali būti lyginamas su kontracepcija. Per metus neplanuotų nėštumų gali pasitaikyti 0,5 – 5 proc., jei metodai taikomi gerai, ir 3 – 20 proc., jei metodai taikomi įprastai.*

**Adresas susirašinėti: ana.tdireito@gmail.com**

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