Article

Couple Beads: An integrated method of natural family planning

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Various fertility indicators are used by natural family planning methods to identify the fertile and infertile phases of a woman's menstrual cycle: mucus observations, cycle-day probabilities, basal body temperature readings, and hormonal measures of LH and estrogen. Simplified NFP methods generally make use of a single fertility indicator such as cycle-day probabilities (Standard Days Method) or mucus observations (Billings Ovulation Method). The Couple Bead Method integrates the two simplest fertility indicators, cycle-day probabilities and mucus observations, expanding its applicability to all women, regardless of cycle regularity and length. In determining cycle-day probabilities, the Couple Bead Method relies on a new data set from ultrasound-derived determinants of gestational age that more directly define the day of conception and the fertile window. By using a visual-based system of inexpensive colored beads, the Couple Bead Method can be used by couples of all educational and income levels.

Lay Summary: Natural family planning methods provide education in regard to the signs of a woman's body which indicate if she is possibly fertile or not. Two important signs are the day of her menstrual cycle and her observations of bleeding and cervical mucus or dryness. The Couple Bead Method teaches a couple how to observe these signs and chart them with a system of colored beads. The Couple Bead Method can be used by women with regular or irregular cycles. The bead sets are inexpensive and consist of a length of plastic cord, colored "pony beads" and safety pins.

Keywords: NFP, Fertility, Sexuality, Marriage, Reproduction, Health, Procreation

INTRODUCTION

The "Couple Bead Method of Natural Family Planning" is a recently developed method of natural family planning which uses a system of colored beads for charting. The system for regular cycles consists of two rows of beads:

- A top row of thirty-five cycle-day beads which are color coded to reflect day-

specific pregnancy probabilities (figure 1). Cycle days refer to the day of a woman's menstrual cycle, beginning with "Day 1," the first day of her period, and continuing sequentially through day 35. Day-specific pregnancy probabilities are defined as numerical probabilities of fertility based solely on the cycle day. Days 1 to 5 are considered "low fertility" days marked by brown beads, days 6 and 7 are days of "intermediate fertility"

Figure 1. First row of Couple Beads with color coded cycle-day probabilities.

marked by yellow beads, days 8 to 14 are days of “high fertility” marked by green beads, days 15 to 21 are days of “intermediate fertility” marked by yellow beads, and days 22 to 35 are days of “low fertility” marked by brown beads. The scientific basis of these probabilities will be discussed later in the article.

- A second row of beads which are attached to safety pins. This row of beads is placed to reflect a woman’s vulvar observations of bleeding and cervical mucus or dryness. *Bleeding* is noted by placing a red bead, *dryness* is noted by placing a yellow bead, *sticky tacky mucus* (sticky, opaque, non-stretchy mucus) is noted by placing a

yellow bead, and *egg white mucus* (wet, lubricative, slippery, stretchy mucus) is noted by placing a green bead (figure 2). The “observation” bead is placed in the evening. The most fertile observation is used in charting the color of the bead. For example if a woman was dry in the morning yet observed *sticky tacky mucus* in the evening, a yellow bead would be placed. Unlike the first row of cycle-day beads which are fixed, the second row of beads vary depending upon a woman’s vulvar observations.

The first row of brown, yellow, and green beads represents a calendar-based

Figure 2. Colored observation beads.

method for women with regular cycles up to thirty-five days. By itself it is an incomplete system and conservatively would preclude intercourse for couples avoiding pregnancy from days 6 through 21. However, it creates an informed context of pregnancy probabilities which allows for a more accurate integration of mucus observations. Thus, the fertility of a given day is judged by consideration of both the cycle-day bead and the vulvar observation. By way of example, days 6 and 7 are days of “intermediate fertility” based upon the cycle-day and day-specific pregnancy probabilities. If a woman observes dryness on these days, she is considered infertile. However if a woman observes sticky tacky or egg white mucus on days 6 and 7, she is considered fertile. In this way, a woman’s observations “modify” the cycle-day probability.

A second string of beads is used for irregular cycles and transition from lactational amenorrhea (LAM) to resumption of regular cycles. In these circumstances, amenorrhea or widely varying cycle lengths preclude use of cycle-day probabilities. Therefore the first row of beads is white and fertility is assessed by vulvar observations alone (figure 3).

SCIENTIFIC AND METHODOLOGIC BASIS OF COUPLE BEADS

At present, fertility awareness/natural family planning (FA/NFP) systems are ranked in the lowest tier of contraceptive effectiveness with an estimated typical failure rate of 24 percent ([Centers for Disease Control 2014](#)). While this estimation may reflect bias as to what constitutes a valid NFP method ([Duane, Motley, and Manhart 2013](#)), it also reflects the difficulties intrinsic to the use of natural family planning systems, including monitoring and interpretation of

fertility indicators. Complex systems involving temperature charting or computer-based hormone monitoring may provide higher effectiveness rates, yet because of their complexity and/or costs, they have limited applicability in resource-limited settings. Conversely, “simple” methods may be easier to use and less expensive, but also less effective.

At present four widely promoted methods of NFP are considered simple in the sense of using a single fertility indicator.

- The Billings Ovulation Method ([Billings LIFE 2014](#)) relies on mucus observations and is noted to be “used by millions of women around the world.”
- The Standard Days/CycleBead Method ([Institute for Reproductive Health 2014a](#)) relies solely on day-specific pregnancy probabilities and “is available in more than fifty countries through NGOs, Ministries of Health, healthcare providers, and retailers” ([CycleBeads 2015](#)).
- The TwoDay Method ([Institute for Reproductive Health 2014b](#)) teaches women to identify the presence or absence of cervical secretions and, like both the Billings Ovulation and Standard Days Method, is offered in multiple countries.
- The Marquette Model using a simple mucus algorithm and quick-start instructions ([Fehring and Schneider 2014](#)).

Each of these simple methods offers ease of teaching and use. However, they also have significant limitations. The Standard Days Method can only be used by women with known, regular cycle lengths of between twenty-six and thirty-two days ([Arévalo, Jennings, and Sinai 2002](#)). In the original study of the method, only 46 percent of women completed thirteen cycles of use. Of those who left the study, 28 percent did so because they had two cycles out of the accepted range of twenty-

Figure 3. Irregular cycle bead string with single row of white beads.

six to thirty-two days; and 9 percent left because they became pregnant (Arévalo, Jennings, and Sinai 2002). At any given time, only 50–60 percent of women will meet the requirements of cycle regularity and length (Institute for Reproductive Health 2014a). Furthermore the method cannot be reliably used in the transition from LAM to resumption of regular cycles, a critical time for child spacing (Arévalo, Jennings, and Sinai 2003). While the Standard Days Method has been vigorously promoted as a simple method for NFP use, even when taught with the option of barrier methods, only 91 of 1,181 (7%) women admitted within the introduction studies and followed with quarterly interviews were still using the method on completion of year 3 (Sinai, Lundgren, and Gribble 2012). Given these limitations, the Standard Days Method meets the “need of only a minority of women of reproductive age” (Fehring and Notare 2004, 109).

The Billings Method cites an ideal effectiveness rate of 99.5 percent and typical use effectiveness of 98.5 percent based on a single study done in China (Qian et al. 2000; Xu et al. 1994). However other studies note a typical-use pregnancy rate of 22.5 percent and a significant gap between perfect and typical use (Trussell and Grummer-Strawn 1991). There have been no prospective studies done which have supported the effectiveness rates of the Chinese study within a different cultural context. While the Billings Method notes there are “four simple rules” for its application, there is in reality multiple “meta-rules” (the rules governing the four rules) and a range of nineteen different stickers and thirteen different symbols within the Billings Method (Smith and Smith 2014). Finally, the TwoDay Method has a typical user effectiveness of 86 percent (Arévalo et al. 2004) and, like the Billings Method, does not consider the simplest fertility

indicator, the cycle day, in women with regular cycles.

The Couple Bead Method integrates the strengths of these existing methods and at the same time addresses their limitations. Couple Beads are a modification of a patented method of FA developed by Maternal Life International (Mulcaire-Jones 2009). They can be constructed for less than five dollars per set using a length of plastic cord, colored “pony beads,” and safety pins. Couple Beads use day-specific pregnancy probabilities as does the Standard Days Method and, like the Billings Ovulation Method and TwoDay Method, use cervical mucus observations. With Couple Beads, these two fertility indicators are integrated so that background pregnancy probabilities based on cycle day can be made more specific based upon the absence, presence, and characteristics of cervical mucus observations. The name “Couple Beads” reflects the “coupling” of the two fertility indicators (cycle-day probabilities + cervical mucus observations) and also emphasizes the importance of both male and female partners (the couple) in using the method.

Methodologically the Couple Bead Method builds upon a more robust data set for establishing day-specific probabilities of being in the fertile window. The new data set is based on the work of Stirnemann et al. (2013) which used fetal crown-rump length biometry to retrospectively establish the day of conception. The day of conception correlates with the day of ovulation since conception occurs within hours of ovulation. Estimates of pregnancy dating based upon crown length biometry were originally derived from IVF embryos in which the date of fertilization was known. The Stirnemann et al. (2013) study used spontaneously conceived pregnancies noting that biometry for spontaneously conceived pregnancies do not differ from IVF-related conceptions.

In contrast to the data from Stirnemann et al. (2013), prior estimates of ovulation/conception have been obtained through hormonal measurements (primarily LH surge), ultrasound estimates of ovulation (follicular collapse), or basal body temperature elevations (post-ovulation). The Standard Days Method was based on computer modeling of indirect measures of ovulation (Lamprecht and Grummer-Strawn 1996). Natural family planning methods have also used method experience with self-reporting by clients as to the day of the cycle on which intercourse occurred. All of these methods are indirect and as such are subject to measurement or interpretation error (Stirnemann et al. 2013).

The data generated by Stirnemann et al. (2013) provide both confirmation and contradiction in terms of prevailing NFP systems’ use of cycle-day probabilities of being in the fertile window. In terms of confirmation, the study notes “The probability of being within the fertile window closely matched previously published results from prospective monitoring of ovulation, with a 2 percent probability at day 4, a maximum probability of 58 percent at day 12, and a 5 percent probability by day 21 of the cycle.” The data is consistent with a robust data set generated by Fehring, Schneider, and Raviele (2006) using an electronic fertility monitor which monitors estrogen and LH surges as well as cycle lengths. The study indicated that the six-day fertile window occurred from days 4 to 23 in 95 percent of all menstrual cycles.

When applied to NFP methods currently in use, the probabilities related to the opening of the fertile window generated by Stirnemann et al. (2013) are relatively congruent with previous research and experience with day-specific probabilities of being in the fertile window from sympto-thermal methods, such as the

Couple to Couple League, the European Sympto-thermal method (Frank-Herrmann et al. 2007), and the Marquette Model (Fehring et al. 2013). These methods use a “five-day” or “six-day” rule which assigns a low risk of fertility on days 1 to 5 or 6 in the absence of cervical mucus.

At the same time, the Stirnemann et al. (2013) data set is problematic for both calendar-based methods such as Standard Days/CycleBeads as well as mucus-only methods.

- In the Standard Days Method/CycleBeads, clients are taught that days 1 to 7 are considered low fertility (Arévalo, Jennings, and Sinai 2002), yet according to the Stirnemann et al. (2013) data the probability of being in the fertile window on day 7 is 16 percent.
- The day-specific probabilities for being in the fertile window are also problematic for the Billings Method which precludes intercourse during menstrual bleeding which generally encompasses the first five days of the cycle—the days *least* likely to lead to conception.

As a whole, the data generated by Stirnemann et al. (2013) provides a stronger evidence base for integrating cycle-day probabilities of conception with vulvar observations of bleeding, cervical mucus, and dryness.

DAY-SPECIFIC PROBABILITIES OF BEING IN THE FERTILE WINDOW

Conception is generally thought to be limited to acts of coitus in the five days preceding ovulation and the day of ovulation itself—the so-called “fertile window” (Wilcox, Dunson, and Baird 2000). If the day of conception is known, then the estimate of the fertile window to include the five days preceding ovulation can be retrospectively calculated to arrive

at day-specific probabilities of being in the fertile window. This is the basis of estimating cycle-day probabilities of being in the fertile window using the data from Stirnemann et al. (2013) (table 1).

In formulating the Couple Bead Method, we divided these probabilities into three categories, low, high, and intermediate (figure 4).

- *Low fertility*, defined by a cycle-day probability of being in the fertile window of less than 5 percent (days 1 to 5 and days 22 to the end of the cycle)
- *High fertility*, defined by cycle-day probabilities of 27 to 47 percent as fertility increases (days 8 to 14)
- *Intermediate fertility*, defined by cycle-day probabilities of 9 and 16 percent prior to high fertility days (days 6 and 7) and 38 to 5 percent as fertility decreases (days 15 to 21)

These categories represent background probabilities based solely on cycle days. In categorizing intermediate fertility, we have shadowed this category within the context of clinical application where pre-ovulatory acts of intercourse on days 6 and 7 are considered intermediate fertility (9–16 percent probabilities of being in the fertile window) and probabilities after the peak of “high fertility” days are considered intermediate as they descend from 38 percent on day 15 to 5 percent by day 21.

As noted above in the introduction, these probabilities are coded by a first row of brown, yellow, and green beads (figure 1).

ADDING VULVAR OBSERVATIONS

By using vulvar observations for the absence, presence, and characteristics of cervical mucus, the pregnancy probabilities

Table 1 Probability of conception and being in the fertile window based upon CRL measurements of gestational age

Day	Probability of conception (%)	Probability of being in the fertile window (%)
1	0.0	0
2	0.0	0
3	0.0	0
4	0.1	2
5	0.2	4
6	0.3	9
7	0.3	16
8	0.4	27
9	1.0	38
10	2.4	49
11	4.8	56
12	7.7	58
13	10.6	55
14	12.6	47
15	13.1	38
16	12.1	28
17	9.9	20
18	7.3	14
19	5.0	10
20	3.4	7
21	2.4	5
22	1.8	4
23	1.4	2
24	1.0	2
25	0.6	1
26	0.3	1
27	0.2	1
28	0.2	1
29	0.2	0
30	0.2	0
31	0.1	0
32	0.0	0
33	0.0	0
34	0.1	0
35	0.1	0
	99.8	

Source: *Stirnemann et al. (2013)*.

for a given cycle day can be modified. In the absence of cervical mucus, the chances of conception approach 0, while in the

presence of “most fertile” mucus the chances of pregnancy increase considerably (up to 0.29) (*Scarpa, Dunson, and Colombo 2006*). By way of example, days 6 and 7 which have intermediate fertility based on day-specific pregnancy probabilities would have low pregnancy probabilities in the absence of cervical mucus (dryness).

Cervical mucus observations also allow for another means to identify the closing of the fertile window. “Peak” mucus is defined as the last day of most fertile mucus (last day of egg white mucus marked by a green bead). Studies have shown that ovulation will have occurred three days post-peak in 96.7 percent of cycles (*Fehring 2002*). The closing of the fertile window can thus be determined by peak plus three days of drying up after day 14. For example, in a given cycle if a woman observed her last day of most fertile mucus on day 13 and has dryness on days 14, 15, and 16 (peak + 3), she would be considered to have low fertility even though her cycle-day probabilities would indicate mid-range probabilities of being in the fertile window. (Three days refers to three “full days” and thus infertility begins on midnight of the third drying up day.)

The descriptive categories of dryness, sticky tacky mucus, and egg white mucus correlate to previously established mucus rating symptoms (table 2). However, they are simplified from four to three categorizations. Studies demonstrate that over 90 percent of women can learn to correctly identify and categorize cervical mucus over the course of 3 months (*WHO 1981*).

**GUIDELINES FOR CHARTING WITH
REGULAR CYCLES**

For women with regular cycles, the integration of cycle-day probabilities and

Figure 4. Day-specific probabilities of being in the fertile window.

cervical mucus observations lend themselves to a seven-day “segmentation” of the fertility cycle. This segmentation is noted on the bead sets by knots and can help couples track their fertility on a week-to-week basis. The guidelines for

Table 2 Classification of mucus symptoms from vaginal discharge adapted to Couple Beads

Mucus score	Feeling	Appearance	Secretions	Bead designation	Feeling	Appearance	Testing
1	Dry, nothing felt	Nothing seen	No secretions	Dryness: brown bead	Dry	Nothing seen	No secretions
2	Damp	Nothing seen	No secretions	Dryness: brown bead	Dry	Nothing seen	No secretions
3	Damp	Mucus is thick, whitish, creamy, yellowish, or sticky	Secretions	Sticky tacky: yellow bead	No feeling of wetness, slipperiness, or tissue glide	Sticky tacky mucus (thick, whitish, opaque)	Secretions which mound up and do not stretch
4	Wet, slippery, smooth	Mucus is transparent, like raw egg white, stretchy/elastic, liquid, watery, or reddish	Secretions	Egg white: green bead	Secretions	Wet, lubricative, tissue glides	Secretions which are slippery, stretchy

Source: Thijssen et al. (2014).

Table 3 Summary of guidelines for regular cycle use

<i>Fertility begins</i>	
<ul style="list-style-type: none">• On day 6 or 7, if there is mucus (either egg white or sticky tacky)• On day 8, if the woman is dry on days 6 and 7	
<i>Fertility ends</i>	
<ul style="list-style-type: none">• Between days 15 and 21, if there has been a peak of mucus plus three days of drying up• At day 21 as long as there is no egg white mucus	
<p>(Drying up can begin from days 8 to 14 and be “carried over” into days 15 to 21. For example, if a woman had egg white mucus on days 9, 10, 11, and 12 (green beads), and then had sticky tacky mucus on days 13 and 14 (yellow beads), and dryness on day 15 (brown beads), infertility would begin at the end of the third drying up day, i.e., midnight on day 15.)</p>	

each seven-day segment are described below and summarized in table 3.

Days 1–7

- Days 1 to 5 are low fertility days (0–4 percent; marked by brown beads)
- Days 6 and 7 show an increasing probability of being within the fertile window (9 percent on day 6 and 16 percent on day 7; marked by yellow beads)
- Days 6 and 7 probabilities are decreased if a woman is dry, thereby making these days “infertile” in the absence of mucus. If there is mucus (sticky tacky or egg white), pregnancy probabilities are increased, and the day is considered fertile. Bleeding (and no observations of mucus) on days 6 and 7 is also considered infertile.

Days 8–14

- These days are “high fertility” regardless of mucus pattern. The probability of being in the fertile window within these days ranges from 27 to 58 percent (marked by green beads)

Days 15–21

- The chances of being in the fertile window decline from 38 percent on day

15 to 5 percent by day 21 (marked by yellow beads)

- Within this segment, the chances of being in the fertile window are diminished once there has been a peak of mucus plus three days of drying up. This drying up sequence is marked by three small orange beads. (See figure 5 with completed bead cycle and orange beads.)

Days 22–28

- Low fertility with probabilities of 1 to 4 percent (marked by brown beads). An exception would be egg white mucus noted in this time frame

Days 29–35

Low fertility less than 1 percent (marked by brown beads).

Gold beads

Gold beads are used to mark acts of intercourse and are placed on the safety pin corresponding to the probability bead of the day. The gold beads are important in the learning phase of the method as their placement reflects comprehension and adherence to method guidelines. (See

Figure 5. Completed regular cycle (note three orange “drying up” beads and gold beads).

figure 5 with gold beads placed on days of intercourse.)

BREAST FEEDING, TRANSITION, AND IRREGULAR CYCLES

Completing a cycle

Figure 5 represents a completed bead cycle. In this example a woman had a thirty-two-day cycle, and each cycle day has an attached observation bead. Women will vary in their cycle lengths, and in cycles less than thirty-five days not every cycle day will have an attached observation bead. After a cycle is completed, the cycle can be recorded on a simple bead chart. (The bead chart consists of a paper representation of the bead rows where bead colors can be either colored or marked for the cycle. The chart also has a place for noting pregnancy intention and breast-feeding status.) Once the bead chart is completed, the observation beads are removed, and a new cycle is started with day 1, the first day of bright, red, vaginal bleeding.

At any given time, it is expected that between 70 and 80 percent of women of reproductive age will have regular cycles. The remaining 20–30 percent may have amenorrhea from breast feeding or may have irregular cycles in the context of oligo-ovulation, discontinuing hormonal contraception, metabolic dysfunction, or pre-menopause. To address these circumstances, the Couple Bead Method provides NFP instruction using a second bead set which emphasizes vulvar observations. This bead set uses an upper row of white beads with an attached safety pin for the observation bead (figure 2). Unlike the bead string with regular cycles, the “background” of cycle-day probabilities is not considered as women may not yet have resumed cycles or may have widely varying cycle lengths. The second bead set is compared to a second “set of clothes”

which a woman may wear on a different occasion. Once a woman has resumed regular cycles, she may begin using the regular cycle bead set.

Of particular importance is the use of NFP during breast feeding and the transition to regular cycles. Transition represents a challenging time to practice NFP (Fehring 2010), as a woman may not have resumed menses; or, if she has, she may not have resumed regular cycles. For breast-feeding women, LAM is taught according to evidence-based guidelines (Labbok et al. 1997). These guidelines demonstrate that if a woman meets the three LAM criteria of amenorrhea, fully breast feeding, and baby less than six months of age, then the chance of pregnancy is between 1 and 2 percent. Once a woman no longer meets one of the three LAM criteria, she begins using the second bead set. Guidelines for use of the second bead set during breast feeding and transition are as follows:

Low fertility:

- Day after day dryness noted by brown beads
- Day after day unchanging sticky tacky mucus noted by yellow beads. The sticky tacky mucus should be small in amount and not changing

Increasing fertility:

- Change from dry to sticky tacky
- Any light bleeding/spotting

High fertility:

- Egg white mucus

If increasing or high fertility is noted, then infertility is presumed after three full days of drying up (placement of orange beads as noted with regular cycles).

Extensive work on the return of postpartum fertility has been done by Bouchard, Schneider, and Fehring (2013) at Marquette University. Data from use of

electronic hormonal monitoring indicate that the first three cycles are typically the longest and most difficult to interpret, with variability in cycle length and mucus patterns.¹ After three cycles, the majority of women will establish cycle regularity and can begin to use the regular cycle bead string. The challenges of using NFP in the transition from LAM to the resumption of regular cycles are best managed in collaboration with an experienced NFP teacher.

Women who are discontinuing hormonal contraception, women who are pre-menopausal, or women who always have irregular cycles will use the second bead string just as women in the transition from breast feeding to resumption of regular cycles do.

ACHIEVING PREGNANCY

The Couple Bead Method can also be used for timing intercourse to maximize chances of conception. Both cycle-day probabilities and vulvar observations may be useful in this regard. Providing education in regard to achieving pregnancy can be a useful adjunct in resource-limited settings which may have a high prevalence of infertility (such as Sub-Saharan Africa). While much of the infertility is tubal-related or secondary to other disease states, the knowledge provided about a woman's fertility cycle can help some couples, both in identifying the fertile window and in identifying patterns suggestive of anovulation or oligo-ovulation.

To achieve pregnancy, the guidelines for avoiding pregnancy are used "in reverse" (figure 6).

Regular cycles

- For regular cycles, intercourse should begin on day 6 or 7 if there is mucus or

Figure 6. Achieving pregnancy with Couple Beads.

- on day 8 if there is no mucus on days 6 and 7.
- Fertility remains high in the presence of egg white mucus on days 8 to 21. However, if during this time frame there is a peak plus three days of drying up, then fertility diminishes by the evening of the third drying up day.
- During these time frames, intercourse every other or every third day is thought to provide the best semen/sperm concentrations.
- After day 21 and/or a peak of mucus followed by three days of drying up, fertility remains low the remainder of the cycle.

Irregular cycles and achieving pregnancy

By definition, if a woman is having irregular cycles it will be more difficult for her to use cycle days. Thus, a couple should look for signs of mucus—the onset of egg

white mucus or a change from dry to sticky tacky.

It is recommended that women with irregular cycles who are not achieving pregnancy meet with their NFP teacher or consult with a healthcare professional. Irregular cycles imply irregular ovulation, and this may be a factor in not achieving pregnancy.

CONCLUSION

We believe the Couple Bead Method is a positive addition to the NFP menu. As a relatively simple method, it can be used by women and couples of all educational levels. By combining two fertility indicators, it can be used in women at all phases of their reproductive life including regular cycles, breast feeding/LAM, transition, and irregular cycles. Experience accumulated by Maternal Life International and affiliate organizations in Uganda, Haiti, Tanzania,

Nigeria, and Malawi has shown that the method is appreciated for its focus on the couple as well as the simplicity and visual appeal of the beads. Going forward, we plan on carrying out prospective studies which can critically evaluate the use and application of the Couple Bead Method.

NOTE

- 1 Richard Fehring, personal communication.

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