

Factors That Interfere With The Interpretation of Mucus

The HPO Axis, Ovulation & the Mucus Symptom:

The menstrual cycle is controlled by three organs known as the **HPO axis** (hypothalamic-pituitary-ovarian axis. :

- the hypothalamus in the brain
- the pituitary gland at the base of the brain
- the ovary

Normal ovulation and the associated mucus symptom depend on the normal functioning of the HPO axis.⁴ In the **normal** menstrual cycle the **mucus symptom** is a sign of impending ovulation. An abnormality at any point along the HPO axis can result in dysfunction of the menstrual cycle with an associated upset of the mucus symptom.⁷ [The HPO Axis](#)

Factors that interfere with the interpretation of the Mucus Symptom:

In the normal ovulatory menstrual cycle during the **years of peak fertility** (ages 20-35), ovulation is associated with an oestrogenic 'build-up to peak' mucus pattern. This normal '**build-up**' of oestrogenic mucus before ovulation depends on both **(i)** normal functioning of the HPO Axis, **(ii)** normal secretion of cervical mucus.

1. **Normal production** of the hormones of the HPO axis: Any **upset** of the normal hormonal balance, i.e. of the HPO axis, may result in cycles that are anovular or are irregular in length causing a disturbed mucus symptom.
2. **Normal secretion** of Cervical mucus: Any **upset** of the secretion of mucus by the cervical crypts could result in a disturbed mucus symptom e.g. as may occur in **normal ageing** of the **cervix** in the pre-menopause.

Factors that cause disturbance of the mucus symptom:

(A) PHYSIOLOGIC FACTORS

(B) EXTERNAL FACTORS e.g. Stress etc.

(C) A third factor would include underlying pathology, this is **outside** the scope of this website.

(A) Physiologic factors causing a disturbed mucus symptom

- e.g. **IN ADOLESCENCE, PRE-MENOPAUSE, & AGEING OF THE**

CERVIX:

- **ADOLESCENCE and the mucus symptom:** In the first four years after the first menstruation (menarche) **anovular** cycles are common.⁶ This may be due to **immaturity** of the HPO axis. The early adolescent menstrual cycles are often anovulatory even though they may appear at regular intervals, as the **positive feedback** causing the LH surge is a **late** maturational event in adolescent development often appearing some years after menarche.⁷ In one study by Dr Hanna Klaus only 50% of cycles were ovulatory one year after menarche; This increases by 10% each year until the woman is 5 years past menarche, when 85% of cycles are ovulatory.^{1,6} Anovulatory cycles lack the 'build-up to peak mucus' pattern of an ovulatory cycle so that a pattern of intermittent mucus without a peak is seen.
- **ADOLESCENCE and the maturity of the HPO AXIS :** The HPO axis has become mature when **(a)** FSH and LH are secreted in response to gonadotropin releasing hormone (GnRH) from the hypothalamus and **(b)** when the **positive feed-back** of rising oestrogen levels causes the LH surge to trigger ovulation.⁵
- **PRE-MENOPAUSE and the mucus symptom:** The menstrual cycle is often irregular at the end of the child-bearing years (*pre-menopause*) due to an increase in the incidence of anovular cycles or of delayed ovulation. In **anovular cycles** the mucosal pattern displays only patches of mucus with fertile characteristics usually without a proper build-up to peak and with either breakthrough or withdrawal bleeding.¹ In cycles with **delayed ovulation** intermittent mucus patches may also be seen in the lengthened follicular phase. The changes in the lengths of the cycle may be due to the marked decrease in the number of ovarian follicles remaining in the ovary at this stage of life, and the efforts of the HPO axis to compensate.
- **AGEING OF THE CERVIX and its effect on the mucus symptom:** The cervix undergoes a natural process of ageing.³ In the pre-menopause there is a considerable decrease in the number of S crypts reducing the number of days of the **more-fertile mucus**. When the cervix has aged, the woman may ovulate but produce no cervical mucus even though she may have a biphasic temperature. As mucus is essential for sperm entry, such women are said to have **non-fertile ovulations**.¹ In the pre-menopause there is also a decrease in the size of the area in the **labia minora** in the vulva that is sensitive to mucus, making it difficult for the woman to perceive the mucus symptom.²

(B) External Factors causing a disturbed mucus symptom:

External Factors e.g. stress, poor nutrition, intense athletic training, hormonal contraception (the 'Pill') can all affect the hypothalamus, and interfere with the secretion of gonadotropin releasing hormone (GnRH) from the hypothalamus.⁷ GnRH controls the release of FSH and LH from the pituitary gland and disturbance of either FSH or LH output can cause anovulatory cycles.¹ **Anovulatory cycles** lack the 'build-up to peak mucus' pattern of an ovulatory cycle so that a pattern of intermittent mucus without a peak is

seen. Other external factors such as medication or a vaginal discharge may also interfere with the cervical mucus pattern.

External factors include:

- **Stress:** Physical or emotional stress can suppress ovulation via the HPO axis. When stress suppresses ovulation, a pattern of intermittent mucus without a peak is seen.¹
- **Nutritional amenorrhea:** Abnormal **body weight**, excessive weight loss affects the normal functioning of the menstrual cycle. Women generally develop amenorrhea with a weight loss of 10-15% below ideal body weight, or when about one third of body fat stores are depleted.⁷ (*amenorrhoea = absence of menstruation*).
- **Athletic amenorrhoea:** Excessive physical exercise may cause an absence of periods, (*athletic amenorrhoea*). Exercise amenorrhea is more common in some sports than others. Sports such as running, ballet, and gymnastics, which require intense daily training combined with lean body build have the highest incidence of amenorrhea.⁷ Even athletes who are having regular cycles of normal length, many may actually have cycles with short luteal phases or anovulatory cycles.⁷
- **Hormonal Contraception:** The 'Pill' contains synthetic oestrogen and progestin which suppress the normal physiologic functions of the ovary, uterus, cervix, vagina and also the HPO axis. The normal physiology of the menstrual cycle is suppressed and therefore the mucus symptom cannot be interpreted.
- **Medication:** Antihistamines tend to thicken mucus; Guafenisin liquefies mucus;¹
- **Vaginal discharge:** Vaginal discharge due to seminal fluid, spermicide, may obscure the normal mucus symptom,¹ as may a vaginal discharge due to an intrinsic factor e.g. vaginal infections, or a **cervical erosion**.
[Effects of Contraceptive Medication on the Cervix and Cervical Mucus](#)

References:

1. Klaus H; 'Natural family planning – Is it scientific? Is it effective?' see page 14, 13, ; Newman Lecture Series 1; May 21; 2000. (online).
2. Odeblad E, 'Investigations on the physiological basis for fertility awareness; Bulletin for the Ovulation Method Research and Reference Centre of Australia, vol 29, no 1, p2-11, march 2002, (internet, Billings Ovulation Method, www.woomb.org)
3. Odeblad E; 'Aging of the cervix' (www.woomb.org).
4. Bates GW, Garza DE, Garza MA; b□Clinical manifestations of Hormonal changes in the menstrual cycle'; Obstetrics and Gynecology Clinics of North America, Vol 17, No 2. June 1990, p299-309
5. Soules MR; 'Adolescent Amenorrhea' page 1089; Pediatric and Adolescent Endocrinology; Vol 34, No 4, August 1087; pages 1083-1102
6. Klaus H; 'Natural Family Planning: A Review'; 1995; from the Natural Family Planning Center of Washington D.C.
7. Mansfield MJ, Emans SJ; 'Anorexia nervosa, athletics, and amenorrhea'; Ped. Clinics of North America; Vol 36, No 3, June 1989, 533-549