

INFERTILITY, HORMONE CHANGES IN WOMEN AND BREATHING

HORMONE CHANGES IN WOMEN AND BREATHING

Men and women do breathe differently! Women tend to suffer from more breathing pattern disorders (BPD) than men ¹. Unfortunately the effects of BPD (also known as dysfunctional breathing) are still under-recognized by health care professionals, however they play an important role in contributing to fatigue, pain, poor sleep and changes to enzyme and hormone synthesis for example.

Hyperventilation plays a big part in BPD and is defined as breathing more than the body needs for normal metabolic requirements to remain stable (in homeostasis). It leads to a marked drop in partial pressure of arterial carbon dioxide (PaCO₂) and a range of consequent physiologic changes such as poor oxygen delivery, vaso- and broncho-constriction (read more in the Article on Chronic Hyperventilation).

Back as far as 1905, it was discovered that the resting pressure of arterial (blood) carbon dioxide was about 8% lower in woman than in men¹; and that airflow and gas exchange alter during the menstrual cycle ².

Women breathe less than men on average as a result, in part, because of a smaller frame and airways, and a shorter diaphragm (by about 9%)³, however a woman's ventilation volume and rate also varies with her menstrual cycle in response to hormonal changes and the same is true during pregnancy and menopause changes?

Up until recently most medication trials and methods have centred on testing males only – animal and human, and often have not taken into account the time of month nor hormonal changes that occur throughout much of a woman's life ^{1,4}.

There is now a move to do more studies on women however there are some things we know already that can be helpful. For example some current research suggests that ensuring healthy breathing - nasal, regular, slow and gentle breathing – can help to minimize the symptoms of premenstrual syndrome (PMS).

Progesterone, which is produced during the time between ovulation and menstruation (the luteal phase), and also during pregnancy, has been found to stimulate breathing. As a result, CO₂ levels drop by around 25%. If levels become hypocapnic (lower than healthy arterial CO₂ levels), the respiratory centre in the brain will register stress and cause the breathing rate to increase even more which can create a range of symptoms which often get called PMS (Premenstrual Syndrome) ^{5,6}.



The follicular phase of the menstrual cycle is when the body is prepping for ovulation and is measured from the first day of your period until ovulation. This is the time that oestrogen production is increasing.

From the **mid-follicular phase to the mid luteal phase** (at between 10 and about 22 days), breathing issues such as wheeziness, breathlessness, congestion and coughing, often worsen ^{7,8}.

In general, body temperature also affects the breathing rate. Just as progesterone levels increase during the luteal phase so too does body temperature and, in combination, will account for some changes to breathing after mid cycle such as an increase in breathing rate.

An interesting study in 2008 indicated that at times when progesterone increases, and breathing ramps up in volume and speed; pain thresh-holds drop ⁹. This means that you feel pain more readily or intensely even when the pain stimulus is less intense than you would normally feel the same level of pain.



Unfortunately pain and dysfunction in general also contribute to changes to breathing rates, and so help “to create a reciprocally negative series of adaptations in which pain alters respiration, which in turn amplifies pain” ¹⁰.

Menstruation has been linked to iron deficiency and anaemia which could suggest why it has been shown to impair cognitive and immune system function and even cause problems during pregnancy in nulliparous women (a woman who has not yet had a baby) ¹¹.

Where breathing may tie into this, is that iron deficiency generally causes the breathing rate to increase. If a woman is already even mildly hypocapnic at baseline (see article on hyperventilation and hypocapnia) because of a faster than healthy breathing rate, then iron deficiency would reduce efficient oxygen delivery even further, impacting on health in general such as cardiovascular and cognitive function, and the immune system.

During pregnancy the breathing rate ramps up naturally so if a woman's breathing rate pre-conception is already faster than functional, whether due to dysfunctional breathing or iron deficiency for example, then her increased breathing rate will likely have an even greater impact on her own and her baby's health.

It makes sense therefore that breathing well is likely to be beneficial in moderating hormone changes in women and in helping to prevent BPD and to reduce symptoms of PMS.

INFERTILITY AND BREATHING

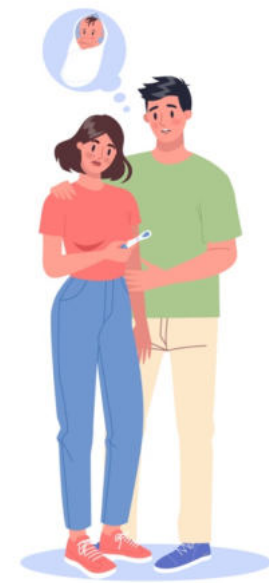
Fertility is affected by a number of factors some of which are clear and others which are difficult to identify.

Infertility may be caused by both physical and emotional influences, however sleep disorders and stress are two factors well recognized for their negative influence on fertility, both for men and women, so ensuring your body functions to its fullest capacity may increase your chances of conceiving a child.

Infertility causes stress and prolonged or heightened stress levels also contribute to reduced fertility or infertility. In the past, talking therapies such as Cognitive Behavioural Therapy (CBT), were usually recommended for those suffering from panic attacks and anxiety however more recently slow diaphragm breathing has been added to such treatment by psychologists, because of its demonstrated effectiveness ¹².

Poor sleep was also identified as a factor which can influence infertility as highlighted in a 2015 American study ¹³.

'Sleep and sleep disturbances are increasingly recognized as determinants of women's health and well-being, particularly in the context of the menstrual cycle, pregnancy, and menopause....



... Sleep continuity disturbance may influence fertility, and do so in one of several ways ... if insomnia represents a response to real or perceived life threat, it may be that insomnia serves as a biological cue for less than optimal circumstances for reproduction.

From an evolutionary point of view, such an association would be adaptive." ¹³

A Taiwanese study in 2017 concluded that non-apnoea sleep disorder puts women at a higher risk of developing infertility ¹⁴.

A 2007 study by Austrian scientists concluded that measuring end tidal CO₂ (et CO₂) which is measured using capnography, offered a promising natural family planning method because the differing levels could help to identify when a woman is in her fertile ovulation (mid-cycle) phase ¹⁵. This is because et CO₂ follows a regular pattern during the menstrual cycle.



When you book an assessment at the Breathe Free Clinic your etCO₂ will be measured using capnography as a matter of routine.

When the nervous system is in Parasympathetic Dominance, (PNS or rest and digest mode), the body is able to rest and repair itself more effectively and the body regulates itself more efficiently, hormones balance and natural immunity is improved. The opposite is true when the body is in Sympathetic Dominance (SNS or Fight or Flight) mode.

Breathing retraining not only helps to calm the body and facilitate healthy sleep but also supports activation of the vagus nerve, maintaining PNS dominance more of the time. It is likely therefore that fertility can be supported by ensuring a woman's breathing is healthy.



Infertility may also be caused or influenced by your physical and genetic make up.

To give your body the best chance of conceiving, it may help to check out your musculoskeletal, circulatory, and nervous systems with a skilled osteopath or woman's health physiotherapist.

They can check for any structural misalignment of the reproductive system such as the pelvic region or lower back and help to ensure joint mobility.

When combined with healthy baseline breathing this will help to optimize blood circulation as well as supporting correct neurological signalling to the uterus and ovaries. As highlighted above, pain creates stress which affects breathing and vice versa so helping to reduce lumbopelvic pain and dysfunction can help improve breathing and also fertility ⁹.



In order to breathe well, you need to be able to access your diaphragm. We often find at the Breathe Free Clinic that tight upper thoracic muscles or interstitial tissue and/or habits of stomach holding and constant abdominal workouts can cause the diaphragm to become locked.

Because the pelvic floor, psoas muscles and the respiratory diaphragm are, structurally and functionally bound together by fascial and muscular connections, osteopathy or pelvic and upper thoracic physiotherapy can also be important to help to enable correct diaphragm function in order to free it up for healthy breathing.



TO RECAP

Functional breathing can:

- **Prevent hypocapnia and ensure efficient oxygen delivery around the body**
- **Help to reduce and control symptoms of PMS and prevent a vicious cycle occurring**
- **Lift your pain threshold**
- **Improve the likelihood of conception**
- **Improve health during pregnancy by reducing the impact of hormonal changes from breathing being healthy pre-conception**
- **Improve sleep breathing disorders**
- **Be helped by ensuring good structural alignment and mobility of reproductive systems in both men and women**

This article barely scratches the surface of these topics. However it's aim is to offer hope by bringing awareness to just how important healthy functional breathing is to wellbeing, especially for women whether to manage symptoms of PMS or to aid conception.

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