The health benefits of nose breathing

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"For breath is life, and if you breathe well you will live long on earth."

Sanskrit Proverb

For the most part people are unaware of their breathing and take it for granted that they do it correctly.

It has been estimated that approximately one third of people don't breathe well enough to sustain normal health. These people do not get enough oxygenation of their cells, tissues and organs. In the book Behavioural and Psychological Approaches to Breathing Disorders, Dr Chandra Patel describes the problem with breathing as follows:

"We start life with a breath, and the process continues automatically for the rest of our lives. Because breathing continues on its own, without our awareness, it does not necessarily mean that it is always functioning for optimum mental and physical health. The opposite is true often. The problem with breathing is that it seems so easy and natural that we rarely give it a second thought."

Although breathing is a natural function of human beings, it can be negatively influenced by many factors such as stress, sitting at a desk all day, eating processed foods, and excessive talking.

In the modern world, many people continuously over breathe. Typical characteristics of over breathing include mouth breathing, upper chest breathing, sighing, noticeable breathing during rest, and taking large breaths prior to talking.

A vital and much underrated organ

The nose is a vital and much underrated organ. To realize its importance we only need to reflect on when we last suffered from a bad cold. Nasal congestion and a runny nose have a noticeable effect on our ability to breathe, our energy levels, our ability to sleep, and our general ability to function.

According to otolaryngologist Dr Pat Barelli:

"The role of the nose in health and in respiration has been greatly neglected by physicians." (Timmons and Ley, 1994, p 47)

Nose breathing versus mouth breathing

The human nose was designed for breathing (and smelling) whereas the mouth was designed for eating, drinking and speaking. However, it has been estimated that up to 30-50% of modern adults breathe through the mouth, especially during the early morning hours.

Mouth breathing is common in individuals whose nasal passages are blocked or restricted. A deviated nasal septum or small nostril size can lead a person to breathe through their mouth instead of their nose. However, breathing through the mouth most of the time was not nature's intention. Many studies have demonstrated that chronic mouth breathing can result in a number of adverse health consequences (see Table 1).

Table 1: Possible adverse consequences of chronic mouth breathing

Chronic mouth breathing may contribute to:

- Introduction of unfiltered, poorly humidified air into the lungs
- Upper-chest breathing (inefficient and tiring)
- Chronic over-breathing
- Greater incidence of snoring and sleep apnoea
- Bad breath, dental decay, gum disease
- Dysfunction of the jaw joint (temporomandibular joint disorders)
- Narrowing of the dental arch, jaw and palate
- Crowded and crooked teeth
- Open bite, malocclusion (teeth not fitting together properly)
- Greater potential for relapse of orthodontic corrections
- Dysfunctions of the muscles around the jaw and lips
- Loss of lip tone with the lips becoming flaccid
- Noisy eating, speech and swallowing problems
- Trauma to soft tissues in the airways
- Enlarged tonsils and adenoids

Adapted from Graham T (2012)

According to Jefferson (2010):

"The vast majority of healthcare professionals are unaware of the negative impact of upper airway obstruction (mouth breathing) on normal facial growth and physiologic health. Children whose mouth breathing is untreated may develop long, narrow faces, narrow mouths, high palatal vaults, dental malocclusion, gummy smiles, and many other unattractive facial features …These children do not sleep well at night due to obstructed airways; this lack of sleep can adversely affect their growth and academic performance. Many of these children are misdiagnosed with attention deficit disorder (ADD) and hyperactivity."

Mouth breathing adversely affects the way the tongue works. It develops a 'tongue thrust'. This affects speech, swallowing and chewing. A tongue thrust occurs as a result of the tip of the tongue resting against or between the front teeth, and the tongue is positioned low in the mouth. The tongue should rest in the top of the mouth (with mouth closed) and provide an internal support for the upper jaw.

Mouth breathing plays a critical role in asthma, especially exercise-induced asthma. In a study published in the American Review of Respiratory Disease, young asthma patients had virtually no exercise-induced asthma after exercising while breathing through their noses. However, they experienced moderate bronchial constriction after exercising while mouth breathing.

Mouth breathing results in the mouth becoming dry. This increases the risk of mouth and throat infections. Mouth breathing also results in pollutants and germs being drawn directly into the lungs. Cold and dry air in the airways makes the secretions thick, slows the cleaning cilia, and slows down the passage of oxygen into the blood stream.

Breathing through the nose has many health benefits (see Table 2). According to Cottle (1958), the nose has at least 30 health protecting functions/roles. These include the following:

- It warms, humidifies, and cleanses/filters air to prepare it for delivery to the lungs.
- The structures within the nose regulate the direction and velocity of the air stream to maximise exposure to a network of fine arteries, veins, lymphatics, and nerves, and to the mucous blanket.
- Nose breathing imposes approximately 50 percent more resistance to the air stream, as compared to mouth breathing. This results in 10 to 20 percent more oxygen uptake. There must be sufficient nasal resistance during inhalation to maintain elasticity of the lungs.
- Nose breathing results in the air passing through the nasal airway being slowed down by shelf-like bony structures in the nose called turbinates. This allows the mixing of the air with an amazing gas called nitric oxide produced in the nasal sinuses (see later).
- Nasal breathing (as opposed to mouth breathing) increases circulating blood oxygen and carbon dioxide levels, slows the breathing rate and improves overall lung volumes.

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Table 2: Benefits of nose breathing

Nose breathing is beneficial because it:

- Warms, moistens and filters the air
- Traps large particles with the nose hairs and small particles via mucous membranes
- Facilitates inhalation of nitric oxide – a vasodilator and bronchodilator that increases oxygen transport throughout the body
- Helps prevent colds, flu, allergic reaction, hay fever, irritable coughing
- Retains some moisture from exhaled air, preventing nasal dryness
- Provides a sense of smell
- Regulates (slows) airflow because of the nose's intricate structures
- Facilitates correct action of the diaphragm
- Promotes activity of the parasympathetic nervous system, which calms and relaxes the body, slows the breathing and the heart, promotes digestion
- Allows the correct position of the tongue (against the upper palate) and lips (together), assisting formation of the natural dental arches and straight teeth
- Reduces likelihood of snoring and apnoea

Adapted from Graham T (2012)

The importance of carbon dioxide

Contrary to popular belief, carbon dioxide is not just a waste gas because it performs a number of essential functions in the body. These include the maintenance of blood pH and the relaxation of the smooth muscles surrounding airways and blood vessels. It also acts as a catalyst for the release of oxygen from the haemoglobin in red blood cells.

In commenting on a recent study carried out at the University of Warwick, Professor Nick Dale said:

"The exciting implication of our study is that carbon dioxide is much more than just a waste product: it can directly signal physiological information, and our work shows the mechanism by which this happens via Connexin 26 (a protein that in humans is encoded by the GJB" gene).".

"As Connexin 26 is present in many tissues and organs, for example the brain, skin, inner ear, liver and the uterus during pregnancy, this discovery should herald a re-evaluation of the potential for carbon dioxide signalling in many different processes such as the control of blood flow, breathing, hearing, reproduction and birth."

There is only 0.03% carbon dioxide in the atmosphere today. Healthy human beings require about 5% carbon dioxide in the alveoli of the lungs. This means that the body has to produce and store carbon dioxide in the lungs and blood.

> Nitric oxide is a potent bronchodilator and vasodilator.

The major determinants of the oxygen content of arterial blood (CaO2) are the arterial oxygen saturation of haemoglobin (SaO2) and the haemoglobin (Hb) concentration. Over 95% of oxygen carried in the blood is attached to haemoglobin. When capillary PCO2 (carbon dioxide partial pressure) rises, there is increased unloading of oxygen in the tissues (the Bohr Effect). However, a reduction in carbon dioxide partial pressure strengthens the bond between oxygen and haemoglobin, resulting in less oxygen being released in to the tissues and organs.

Mouth breathing is a typical characteristic of over breathing. When an individual over breathes, too much carbon dioxide is lost from the blood and this results in reduced oxygenation of tissues and organs. In contrast, when breathing volume is reduced towards normal, through nose breathing, higher carbon dioxide in the blood decreases the affinity between oxygen and haemoglobin, resulting in greater oxygenation of tissues and organs.

Nitric oxide and nose breathing

Nitric oxide is a gas that is often regarded as an environmental pollutant. However, in 1998, three American scientists were awarded a Nobel Prize for their discoveries concerning nitric oxide as a signalling molecule in the cardiovascular system. These scientists originally named this gas, endothelium derived relaxing factor (EDRF) because they discovered that a continuous generation of it occurs in the endothelium of blood vessels. Sometime later EDRF was identified as nitric oxide.

Enzymes responsible for nitric oxide production have been demonstrated both in the nose and in the paranasal sinuses. Nitric oxide is a potent bronchodilator and vasodilator. Therefore it helps lower blood pressure and significantly increases the lungs' oxygen-absorbing capacity. It is also known to be antifungal, antiviral and antibacterial.

According to Lundberg (2008):

"Nitric oxide gas from the nose and sinuses is inhaled with every breath and reaches the lungs in a more diluted form to enhance pulmonary oxygen uptake via local vasodilatation. In this sense nitric oxide may be regarded as an 'aerocrine' hormone that is produced in the nose and sinuses and transported to a distal site of action with every inhalation."

Chang (2011) named nitric oxide the 'mighty molecule' and noted that it is an active component of the cardiovascular, endocrine, and immune systems, and is extremely versatile and significant within and throughout the human body. The fact that nitric oxide plays a significant role in cardiovascular health is evidenced by the fact that one of the Nobel Prize winners mentioned earlier wrote a book titled 'No More Heart Disease: How Nitric Oxide Can prevent - Even Reverse – Heart Disease and Strokes.'

Changing breathing behaviour

There is little awareness and understanding within the medical profession of the adverse health implications of chronic mouth breathing. A conscious effort to ensure that people predominately nose breathe would likely result in a healthier population and a resultant decrease in healthcare expenses. The earlier chronic mouth breathing is identified the easier it is to change to nose breathing. Such a change can be facilitated by 'breathing retraining'. This is a simple process of identifying incorrect breathing habits and replacing them with the correct ones. The best known forms of breathing retraining are the Buteyko Method, the Papworth Method, and pranayama (in yoga, this is the regulation of the breath through certain techniques and exercises).

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