



# Buteyko breathing method – an aid to improving gas transfer in Cystic Fibrosis

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Cystic Fibrosis is a condition that mainly affects the respiratory and digestive systems in the human body. The CFTR (cystic fibrosis transmembrane conductance regulator) is a protein found in the human body that regulates the movement of salt ions and water across membranes in the body. The CFTR gene is responsible for the expression of the CFTR protein. A mutated gene sequence of the CFTR gene results in the expression of a mutated CFTR protein – resulting the creation of a mucus layer in the respiratory tract and the digestive system which in turn results in a blockage in the movement of ions and water mainly in epithelial cells that line the lungs and pancreas of the digestive system – the condition known as Cystic Fibrosis.

One of the main complications involved in Cystic Fibrosis is the difficulty in breathing and general lung function due to the layer of mucus that lines the airways. Up to the present day, many studies have been conducted into various mechanisms of improving the gas transfer capabilities in people with cystic fibrosis. These mechanisms are physical, chemical and enzymatic. To date there have been minimal studies of using natural methods to improve lung function in people with Cystic fibrosis. In recent times however, a new breathing technique – Buteyko breathing, has come to the fore in the alleviation of symptoms of different respiratory conditions. This paper will discuss and present a case for the employment of the Buteyko breathing method as an aid in the improvement and management of lung function in people with Cystic Fibrosis.

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## Table of Contents

1.0	Cystic Fibrosis.....	3
1.1	A genetic condition.....	3
1.2	Gas exchange in the lungs.....	3
2.0	Buteyko.....	5
2.1	The method.....	5
2.2	Buteyko – its use in the treatment of respiratory conditions.....	5
2.3	Buteyko method and the CFTR gene.....	6
3.0	Conclusion.....	6
4.0	References.....	7



## 1.0 Cystic Fibrosis

### 1.1 A genetic condition

Cystic fibrosis is a hereditary genetic condition caused by mutations of the CFTR (Cystic fibrosis transmembrane conductance regulator). The CFTR gene instructs the formation of an ion channel that allows movement of negatively charged particles called chloride ions across the membrane barrier of cells. This flow of chloride ions regulates the movement of water in tissues, which is necessary for the production of thin, freely flowing mucus.

CFTR mutations disrupt the function of the chloride channels, anomalies in the gene sequence of the CFTR gene translates into poorly functioning chloride channels, preventing them from regulating the flow of chloride ions and water across cell membranes. As a result, cells that line the passageways of the lungs, pancreas, and other organs produce mucus that is unusually thick and sticky. This mucus clogs the airways and glands, causing the characteristic signs and symptoms of cystic fibrosis<sup>1</sup>

### 1.2 Gas exchange in the lungs

The role the respiratory system plays in the human body is primarily to provide a mechanism of gas transfer, oxygen in, carbon dioxide out, in the body. Gas exchange in the lungs takes place in the alveoli of the lungs. The cell layer of the alveoli is just one cell thick, these cells are the air-blood barrier where gas exchange is regulated. When air is taken into the lungs and the alveoli, oxygen transfers across this barrier into the blood, which is oxygenated and pumped through the body to supply muscles and organs with the necessary oxygen to function. Similarly, carbon dioxide (a 'by product') is returned to the alveoli in the lungs and dispersed into the atmosphere. This dual mechanism of gas transfer is also known as diffusion of gases across the air-blood barrier.

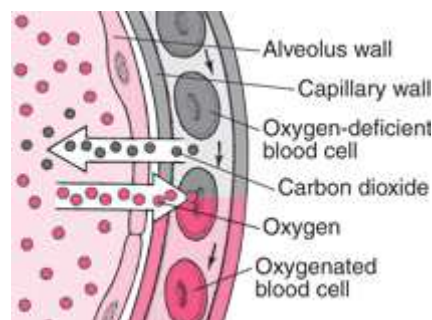


Fig. 1 A diagrammatic representation of gas transfer in the lungs<sup>2</sup>



Carbon dioxide is a by-product or 'waste' of cellular respiration in the human body. In the presence of oxygen, cellular respiration results in glycolysis. Glycolysis is the production of energy, water and carbon dioxide from food molecules. Although Carbon dioxide is traditionally known as a waste product of the cellular respiration mechanism in the human body, it also plays a vital role in regulation of how our body works. A rising concentration of carbon dioxide in the blood causes a drop in pH, mechanisms in the body respond by increasing the number and rate of nerve impulses that control the action of the intercostal muscles and diaphragm, thus resulting in an increase of the rate of lung ventilation which quickly brings the CO<sub>2</sub> concentration of the alveolar air, and then of the blood, back to normal levels<sup>3</sup>.

In people with cystic fibrosis, gas exchange is impeded by the mucus layers which cover the cell layer in the alveoli, resulting in poorly oxygenated blood and difficulty in the dispersal of CO<sub>2</sub>. Increased levels of CO<sub>2</sub> in the blood results in an increase in lung ventilation (also known as hyperventilation), leading to lung injury and lung scarring.



## **2.0 Buteyko**

### **2.1 The method**

“The Buteyko method is named after its founder Doctor Konstantin Buteyko. It is the most effective drug-free approach for the management of asthma and other breathing related problems. It can be practiced by both adults and children, and gives quick and consistent results.

The Buteyko method is neither a medical treatment nor procedure. It does not involve any medication, homeopathy or herbs. It is series of lectures related to breathing which enables people to understand a concept of 'normal breathing' or breathing according to physiological norms. It contains simple breathing techniques and logical instructions to follow. It also gives the means of controlling breathing parameters without any technical appliances. Buteyko method brings the physiological parameters of the body to the norm. It can be easily incorporated into the daily life of any contemporary person. It does not require you to interrupt your everyday activities to perform any sophisticated procedures similar to yogi's 'asana'. You can use the concept of the method at any time in any situation<sup>4</sup>.”

### **2.2 Buteyko – its use in the treatment of respiratory conditions**

The buteyko method is used to correct what is commonly known as ‘over breathing’ or hyperventilation. Over breathing can be a symptom of many respiratory illnesses. When a person over breathes or hyperventilates, there is a larger than normal decrease of CO<sub>2</sub> in the blood as it disperses. Over breathing on a permanent basis can cause the respiratory centre in the brain to expect a lower level than normal of CO<sub>2</sub>. Over time this level will be accepted as ‘normal’ even though it is less than the body requires for good health<sup>5</sup> and blood pH regulation. Teaching of the Buteyko method has corrected ‘over breathing’ in patients worldwide, mainly in the treatment of asthma.



### 2.3 Buteyko method and the CFTR gene

Recently, academic information has become available from Ohio State University which shows the Buteyko breathing method can help to regulate the CFTR gene. ‘Medical studies have proven that 100% of patients with CF suffer from chronic alveolar hyperventilation and that alveolar hypocapnia modulates lung injury. With deterioration of pulmonary parameters in cystic fibrosis patients, there is an increasing dis-regulation in the work of the CFTR gene. Chronic hyperventilation generates an array of pathological changes in all vital organs, where cell hypoxia and reduced perfusion, together with the suppressed immune system, are some of the expected effects<sup>6</sup>. The Bohr effect which states that when ‘carbon dioxide concentration in the blood is on the low side, then haemoglobin does not release as much oxygen, and so the body doesn't make as much energy, carbon dioxide or water at that time<sup>7</sup>’ also suggests that CO<sub>2</sub> levels in the blood is vitally important for oxygenation of organs and muscles in the body. In cystic fibrosis, this is critically important as blood will better derive energy from food if it is sufficiently oxygenated.

### 3.0 Conclusion

The above discussion of the effects of Buteyko breathing on the levels of CO<sub>2</sub> in the blood and the studied effects of buteyko breathing on the CFTR gene regulation shows a promising non-invasive, natural method of improving gas transfer in the alveoli of lungs in people with Cystic Fibrosis. As discussed above, hyperventilation causes lung scarring in cystic fibrosis, further exacerbating the condition and decreasing lung function. The Buteyko breathing method has documented results where by subjects who practice the method are less likely to suffer from hyperventilation and thus reducing the effects of hyperventilation on the lungs. The Buteyko breathing method has delivered results for other chronic respiratory illnesses and until investigated, the promising effects of the Buteyko breathing method is relatively unknown in people with Cystic Fibrosis.



#### 4.0 References

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