

Anatomy and physiology related to BIM- Asthma Attack

Breathing or ventilation is the movement of air into and out of the pulmonary airways and lungs. The purpose of ventilation is to allow for gas exchange within the alveoli to occur⁵ - provide the body with oxygen and remove excess of carbon dioxide (CO₂). Maintaining the correct balance between oxygen and carbon dioxide is critical because these gases rely on each other to keep the body in an optimal condition.² Ventilation is adjusted to match the body's metabolic needs⁵. Sometimes this automatic adjustment becomes dysfunctional.

Breathing that meets the body's needs plays a vital role in the human organism; however, breathing more than is required at a particular point (overbreathing or hyperventilation), creates imbalance between oxygen and CO₂, which may result in serious health conditions in any of the body's systems.

The Buteyko Breathing Method links hyperventilation and hypocapnia (low level of CO₂ in the blood) with asthma. It is based on the contemporary understanding of the immense biological role of carbon dioxide gas in the human organism¹. This gas is critical for regulation of many bodily functions such as the acid/alkaline balance of blood. To have optimum oxygenation of tissues and organs the body requires 5.5-6.5% CO₂ in the lungs.⁴

Multiple studies have shown that on average, asthmatics breathe two to three times more air than people without asthma (Bowler 1998, Hibbert 1988 as cited in Stark 2002)². Asthmatics tend to breathe through their mouths instead of their noses, and also at a higher than normal breathing rate. On average, asthmatics are breathing 12 to 14 liters of air a minute instead of the typical 4 to 6 liters of air a minute when they don't have an attack.

Over time, this excessive breathing pattern causes a progressive loss of CO₂ and the brain adapts to lower pressures of arterial CO₂ (33 mm Hg instead of the normal 40 mm Hg) as the trigger point for initiating the next breath. This results in chronic over breathing.

When a person with asthma is exposed to triggers such as dust mites or pollen, these triggers cause stress on the body that activates the fight or flight response, causing hyperventilation. The breathing pattern is increased even more and upsets the critical balance between oxygen and carbon dioxide.

This excessive breathing pattern results in an abnormal loss of CO₂. The body's pH shifts towards alkalinity, the blood haemoglobin becomes 'stickier', retaining oxygen instead of releasing it, resulting in poor oxygenation of the tissues and vital organs (Bohr effect). The Bohr effect means that the more you breathe, the less oxygen your body is able to use. When tissues are deprived of oxygen, they produce lactic acid. Its accumulation makes muscles ache. This explains the sore chest muscles following a severe asthma attack.

Professor Buteyko perceived asthma as primarily a defense mechanism against the excessive loss of CO₂ through over ventilation. By narrowing the airways, the body is trying to retain the air inside the lungs. During an asthma attack it is considerably harder to breathe out than it is to breathe in, which supports this theory.²

When carbon dioxide levels drop too low

- smooth muscle wrapped around the airways spasms, giving the feeling of chest tightness
- mast cells are stimulated to increase histamine production causing further spasm of smooth muscle, swelling of the airway inner lining, and increased mucus production
- mucus production is stimulated, and its movement in the bronchioles may be heard as a wheezing noise

Hyperventilation also causes cooling and drying, and increased inhalation of irritants and allergens. Mucus production is increased to lubricate the airways. The airways narrow even more to prevent further loss of heat, water and intrusion of irritants.

Having difficulty to breathe, the asthmatic obeys primal instincts and breathes more.³ This causes further respiratory alkalosis, leading to more asthma - a vicious cycle

At this point usually a reliever medication is used. This drug is a smooth muscle relaxant and allows the airways to open. Adrenalin-based reliever medication increases the breathing rate as a side effect, continuing the hyperventilation - a vicious cycle.

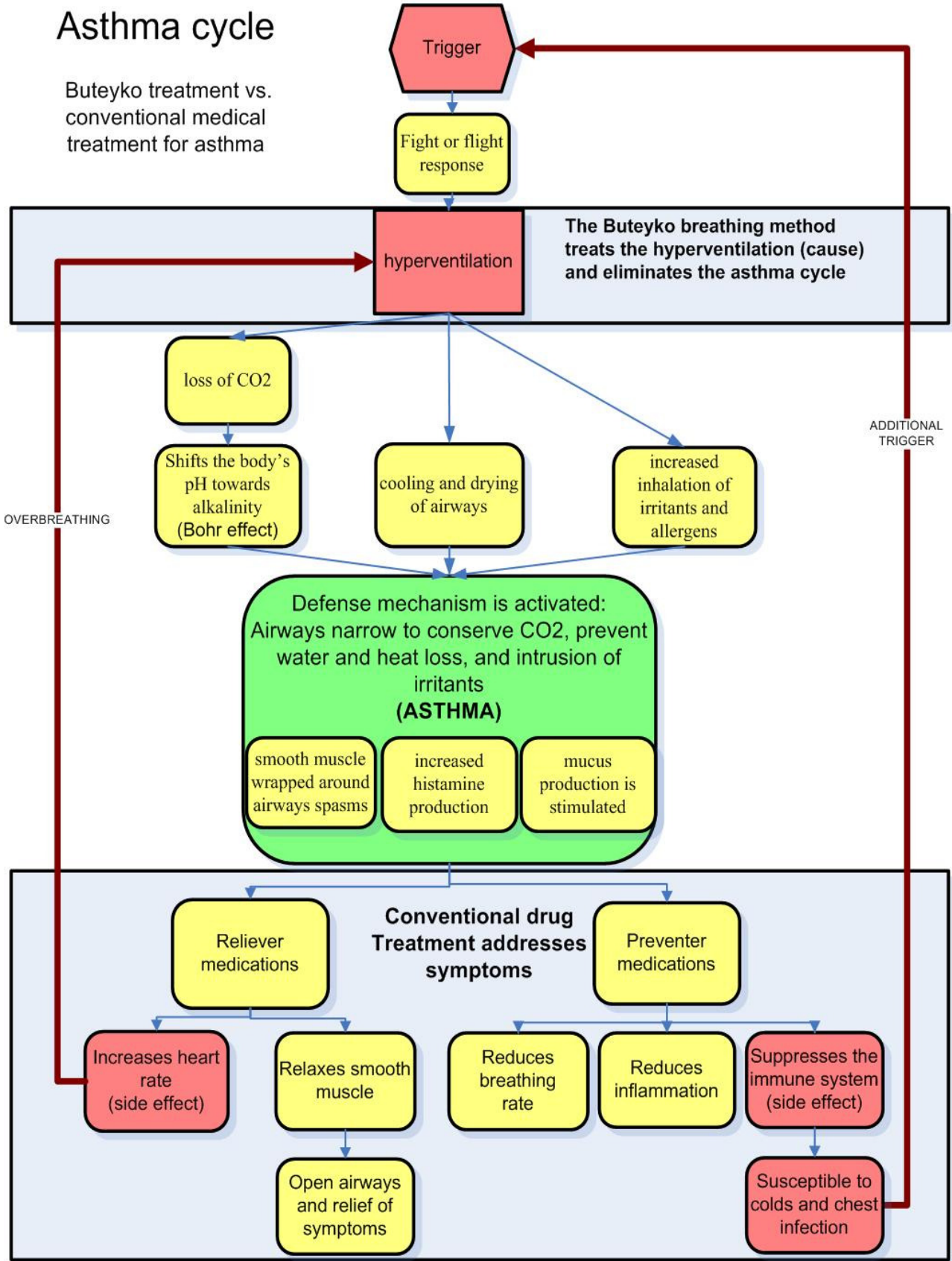
Increased use of reliever medication requires steroid preventer medication. This drug reduces the inflammation and also reduces the breathing rate resulting in less asthma symptoms; however, it also suppresses the immune system, the person is susceptible to more colds and chest infections that are more stress on the body and the vicious cycle starts all over again.^{2,3}

In a severe asthma attack or 'Status asthmaticus', plugging of the airway is so severe, that the work of breathing becomes much greater than normal. As a result of this extra work a lot more CO₂ is produced than normal. Entire sections of the lungs might collapse as they are cut off from ventilation. As a result, the amount of oxygen in the blood falls dramatically and the carbon dioxide levels rise dangerously. This kind of asthma is extremely dangerous and must be treated immediately.²

The Buteyko exercises reverse the process by correcting the hyperventilation pattern, the root cause, and eliminating the carbon dioxide loss, so the body does not need to activate this defense mechanism and asthma symptoms are avoided.

Asthma cycle

Buteyko treatment vs. conventional medical treatment for asthma



References

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