Oxygen

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For your “car” of a body to go it needs

Diet “fuel in the tank”
Mitochondrial “engine”
Oxygen
Thyroid “accelerator pedal”
Adrenal “gear box”

“Oxygen – even I know what happens when my cylinder runs out!”
Coal miner with pneumoconiosis, Annesley Woodhouse, Nottinghamshire. Circa 1985

The symptoms of poor oxygen delivery are therefore all the symptoms of poor energy delivery mechanisms vis:

Physical fatigue with post exertional malaise

Mental fatigue

Weak muscles with no stamina

Poor energy delivery to the heart – POTs and chest pain

Poor detoxification

Poor immune system

Ultimately organ failures

The Science

Oxygen is essential for aerobic metabolism in mitochondria.

Oxygen in inhaled by the lungs and there it hops onto haemoglobin within red blood cells. They “glow” red with oxygen.

It is carried round the body in the blood stream and when it gets to a busy cell, oxygen hops off haemoglobin into the mitochondria so they can use oxygen to ”burn” fuel. Red cells turn a bluish colour.

The question is how does oxygen know to hop on to haemoglobin in the lungs and hop off near mitochondria?

The answer is acidity and this comes from carbon dioxide

Our lungs are not primarily designed to acquire oxygen, they evolved to hang on to carbon dioxide (CO2). CO2 dissolves in plasma as carbonic acid and this controls when and where red blood cells, containing the oxygen carrying molecule haemoglobin, either grab or release oxygen. In the lungs, CO2 levels are low so oxygen sticks to haemoglobin. In the tissues where CO2 is the exhaust gas of busy mitochondria, CO2 levels are high and so oxygen is released from haemoglobin. The mechanism is acidity. CO2 dissolves in blood as carbonic acid. Low acid in the lungs and oxygen is grabbed, high acid in the tissues and oxygen is released.

This does make good physiological sense! It means that oxygen is delivered precisely to working mitochondria and not wasted where it is not needed. To do otherwise would be horribly inefficient!

Lungs – low CO_2, alkali blood, oxygen sticks to haemoglobin.

Mitochondria – high CO_2, acid blood, oxygen is released from haemoglobin.

The effects of over breathing.

Many people, for many reasons, over-breath. Often this is driven by the stress hormone adrenalin. This has the disastrous metabolic effect of washing CO2 out of the blood stream. Blood becomes too alkali and oxygen sticks more avidly to haemoglobin. And remains stuck there! This means that oxygen delivery to our mitochondria is impaired. Instead of oxygen being released it remains trapped in haemoglobin. Mitochondria are starved of oxygen and symptoms result.

What – the symptoms	Why	How to treat
Obviously, fatigue! All the symptoms of poor energy delivery to the body, the brain and the heart. See chapter 2.	If you cannot get oxygen to your mitochondria, then they will go slow	Do the breathing exercises below
Mouth breathing …….	This reduces the dead space of respiration. Less exhaled air is re-inhaled and so more CO2 is expelled. The 'dead space' is the volume of air that remains in the airways with exhalation. Relative to air it is rich in CO2. This is re-inhaled and helps to maintain the acidity of the blood.	NEVER breath through your mouth. Even with exercise. Many athletes improve their performance by nasal breathing. Mouth breathing is only necessary with extreme demands when mitochondria are producing huge amounts of CO2
…..which results in dry mouth	The nose has a delicate system of turbinates to warm and moisturise air that is inhaled. Mouth breathers lose much water	Shut your mouth!
Tooth decay and gum disease	Microbes in the mouth love oxygen	Nose breath And of course, avoid carbs in the diet!
Long term mouth breathing changes the anatomy resulting in nasal obstruction, crowded teeth and undershot jaw.	The pressures within the upper airways pull and push the airways into shape.! The more you nose breath the more open the passages become.	Shut your mouth! When talking, learn to breath in through your nose and then speak (this also gives the other person a chance to get a word in edgeways!)
Sinusitis	Mouth breathing means the sinuses are not aerated and so prone to infection. Mucous in the nose is not properly circulated. The more you mouth breath the more the nasal cavities collapse.	Open up the nasal airways by sniffing iodine with a salt pipe or sniffing essential oils such as wintergreen. Then keep them open with nasal breathing. If you do not use it you lose it
		Do breathing exercises one nostril at a time. See below
Snoring and sleep apnoea	The upper airways are not inflated, narrow and collapse during sleep	Nose breathe. Tape your mouth shut at night
Asthma……	The bronchoconstriction of asthma is partly an attempt by the body to retain CO2. Unfortunately, it has the opposite effect – the brain panics, produces adrenalin which drives respiration.	Asthma can be reversed with the breathing exercises below. You can reduce the adrenalin with slow breathing and diaphragmatic breathing.
……and chronic obstructive airways disease	Mucous build up in the lungs is again partly an attempt by the body to retain CO2	COPD can be greatly improved by the exercises below. Avoid dairy products which produce catarrh. Sniff iodine in a salt pipe to deal with any infection. Iodine is also anti-allergy

Autonomic nervous system imbalance. Too much sympathetic drive. Fight or flight. High blood pressure, tachycardia, anxiety, diarrhoea, perhaps tremor, sweating and insomnia.	If the brain perceives that it is not getting oxygen to its mitochondria, then it panics and generates adrenalin. This drives hyperventilation and makes things much worse! This is a real vicious cycle.	Do the breathing exercises below
Too little parasympathetic action. Rest and digest. Poor gut function: indigestion, bloating, constipation	With hyperventilation breathing takes place with the chest muscles instead of the diaphragm. The diaphragm does at least two other important jobs: Not only does it suck air in from the nose, the negative pressure generated also sucks blood into the chest for the rest of the body thereby improving circulation.	Learn diaphragmatic breathing
	The diaphragm massages the whole of the gut, liver, pancreas, spleen and kidneys and stimulates blood and lymphatic circulation	Learn diaphragmatic breathing
Shortness of breath is a feature of Long Covid. Almost certainly this is hyperventilation.	The mechanism of this is not clear. Possibly infection of the vagus nerve, possibly the pro-inflammatory effect of spike protein	Do the breathing exercises below

Please note that a pulse oximeter measures the oxygen saturation of haemoglobin. It does not reflect oxygen delivery to the tissues. Just because you may have good oxygen saturation does NOT mean that there is good oxygen delivery to the tissues.

https://medicine.uiowa.edu/iowaprotocols/pulse-oximetry-basic-principles-and-interpretation

How to prevent over-breathing: nose breathe, learn to use your diaphragm, slow your breathing down.
FIRST nose breathe.

First you need to open up the nostrils. Cut out dairy products which are catarrh forming.

Breathing through the nostrils should be silent – any noise suggests blockage. Clear this by sniffing iodine. Put 2 drops of 15% Lugol's iodine into the mouthpiece of a salt pipe and sniff this. You should be able to smell the iodine. Often this mobilises mucous which you can clear by "hawking" it to the back of the throat, so it is swallowed. Essential oils often effective – such as eucalyptus or wintergreen.

Test one nostril at a time by closing off one with your thumb. If blocked, then sniff iodine or oils through the blockage. You should be able to breath noiselessly at rest through one nostril.

Once the nasal passages are clear, keep them so by never mouth breathing. Keep your mouth shut!

THEN breathe with your diaphragm.

The body can suck air into the lungs in two ways – with the diaphragm and with the chest muscles. At rest we should largely use the diaphragm for all the reasons detailed above. When physical demands are high, such as when we are sprinting at the end of a long hunt in order to catch our prey, the chest muscles are additionally employed. But this should be a rare event when the adrenalin is running high!

When you use your diaphragm to breathe, the tummy should rise and fall with each breath and the chest remains still.

Lie down, put your right hand over your tummy button and the left over your heart. Breathe so only the right hand moves and the left stays still. Once you get the idea, you can do this walking around, sitting or whatever.

NOW YOU ARE READY to slow your breathing down.

We should breathe between 5-6 diaphragmatic breaths per minute with normal activity. At rest do the exercises below to slow this even further to reset the respiratory rate.

Lie or sit down at rest with a watch.

Start with a full cycle every 10 seconds. Breathe in slowly for 4 seconds, then out for 4 seconds, then hold for 2 seconds. Use the muscles at the back of your nose to slightly constrict the exit of air through the nose and increase the pressure in the airways. This should feel very comfortable. Do this for 2 minutes.

Then extend the cycle to every 12 seconds. Breath in slowly for 4 seconds, out for 5 seconds then hold for 3 seconds. Do this for 2 minutes.

Extend the cycle to every 15 seconds. Breathe in slowly for 4 seconds, out for 6 seconds and really squeeze out every last bit of air from your lungs.

Keep extending the cycle until you start to get “air hunger”. That is to say you have an over-whelming need to take a deep breath. Resist this. Now you are resetting your breathing “thermostat”. Now you are retraining your respiratory centre in the brain not to panic.

It should be very possible to get down to 3 breaths per minute at rest. There may be a mild sensation of air hunger. Resist the urge to gasp! You will be massively improving your oxygen delivery to your mitochondria!

Diaphragmatic Breathing improves circulation

The diaphragm is not only responsible for breathing, it is also essential to return venous blood to the heart.

As you breath in, the diaphragm descends, and this sucks venous blood into the chest and squeezes venous blood from the abdomen up into the chest.

As you breath out, the diaphragm ascends, and sucks venous blood into the abdomen from the legs.

Ditto in the lungs – inhalation draws blood into the lungs from the heart and exhalation squeezes the blood from the lungs back to the heart.

Other things you can do to retrain your breathing

Singing - this involves long exhalations. That is good.

Humming through your nose. I can't sing. I think I can, but my girls tell me I can't! So it is not a good option for me.

Learn to play a wind instrument – again involves long exhalations.

When you talk, make a conscious effort to breathe in through your nose. I know some people who can start a sentence before they have finished the one before! They are mouth breathers.

When you go walking or jogging, keep you mouth shut. Again, there may be an early sensation of air hunger and a desire to open the mouth and gasp. Resist it!

When you go walking, exhale, hold your breath and keep walking, count your steps until air hunger makes you want to breathe again. Aim to increase the number of steps.

Emil Zátopek won 4 Olympic gold medals and broke 18 world records running with under-ventilation training. He did all the above. Even for him it was painful resisting the air hunger, but it worked! He had more energy.

.When Emil Zátopek was running his first ever marathon during the Olympic Games in Helsinki, his strategy for the task was simple: stick with Jim Peters, the British world record holder. After the grueling, very fast fifteen kilometers, Peters already knew that he had overestimated his stamina. Zátopek asked him what he thought of the race so far. The surprised Englishman told Zátopek, trying to deceive him, that the pace was quite slow. The Super Czech simply accelerated and, as Peters did not finish the race, Zátopek set a new Olympic record and won his third Olympic medal that day.

Wim Hof breathing

*Wim Hof (*born 20 April 1959), also known as The Iceman, is a Dutch motivational speaker and extreme athlete, noted for his ability to withstand low temperatures. He holds the Guinness record for a barefoot half marathon on ice and snow.

We should not lead lives that are too comfortable, and it is a good idea to shake things up occasionally. Wim Hof has demonstrated great benefits from episodes of forced hyperventilation. Only do this lying down until you become familiar with the symptoms generated. Breathe in as deeply as you can for 3 seconds then out for 3 seconds and really squeeze all the air out. Keep going for 30 breaths. This process takes 3 minutes. At your last exhalation, stop with the lungs not squeezed out but relaxed and hold your breath. Many find they do not need to breathe for 2 or 3 minutes! Hold your breath until air hunger prevails. Repeat for 3 cycles.

One should be left with a feeling of peace and calmness. I believe this is medicated by endorphins. In this brief window of hyperventilation, we are mimicking the breathing patten that comes with a great excitement, such as hunting our prey or having sex, and that too is followed by a pulse of endorphins.


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Summary: Mitochondria need Oxygen!

To get oxygen into our mitochondria we must breathe less.

Address over breathing by –

- Nose breathing.
- Breathing using your diaphragm.
- Practising slowing your breathing down.
- Use other techniques such as –
  - Singing.
  - Humming through your nose.
  - Learning to play a wind instrument.
  - Try Wim Hof breathing.

In summary – KEEP YOUR MOUTH SHUT!