



Yoga Science Academy

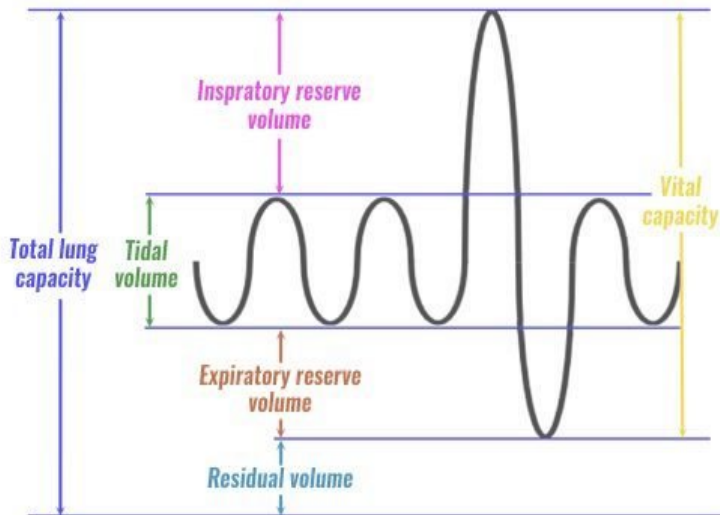
Pranayama Online Teacher Training

Session II



The Science of Breath - from Air to cellular power

External Respiration



Average

- Tidal lung volume 0,65l
- Residual lung volume 1,5l
- Lung volume max. 6l
- Inspiratory reserve volume 3l
- Expiratory reserve volume 1l
- 23.000 breaths/day
- 16 breaths/minute

We don't use the full capacity of our lungs and can expand on the respiration volume with training. That leads to slower and deeper breathing.

Our air, the main source of oxygen and internal respiration



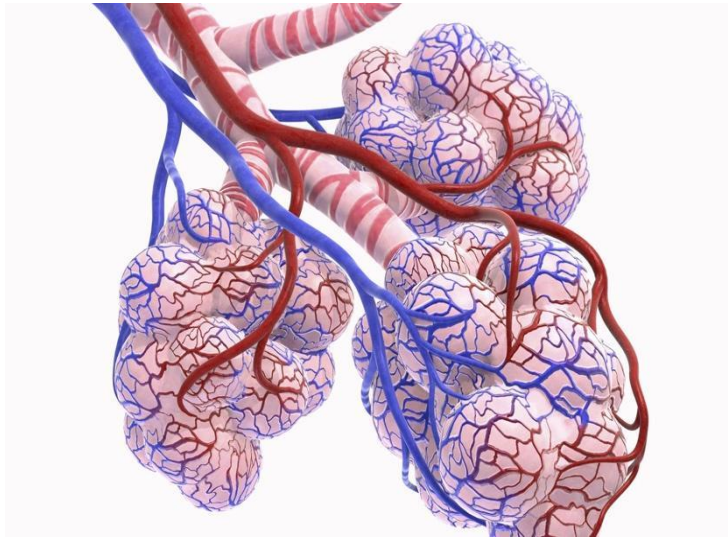
INSPIRATION	COMPONENTS	EXPIRATION
78%	Nitrogen	78%
21%	Oxygen	17%
0,04%	Carbon dioxide	4%

In Pranayama we aim to INCREASE the accumulation of CO₂ in the blood to promote higher uptake of oxygen into the cells.



The Pathway of our Breath

Nose/mouth → air tube → lobe of the lungs → bronchia → alveoli → blood → body tissue



ALVEOLI

- 300 Million
- In the lower compartment of the lungs
- 80 - 140 m² surface
Strong resorption power

- Gas exchange takes place in the lungs, where the capillaries enfold the alveoli
- O₂ and CO₂ are exchanged in the blood vessels around the alveoli
- CO₂ blood is transported to the lungs for exhalation
- O₂ is transported through the blood to the body tissue for inner respiration
- Inside the cells the transversion from oxygen to POWER takes place

Cellular respiration

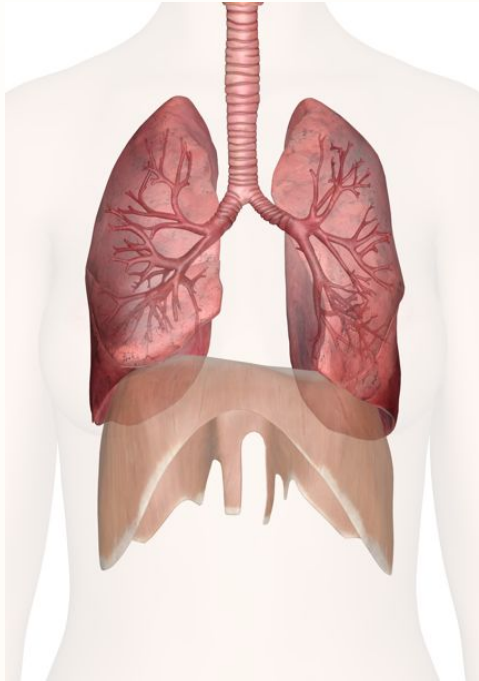


Skin respiration 375ml H₂O/day

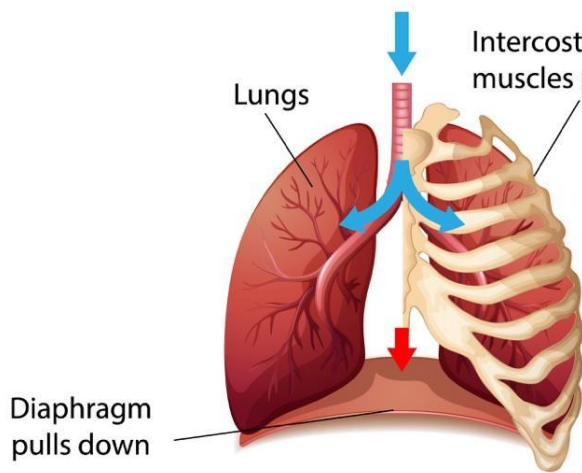
Oxygen cannot be transformed into energy. It's electrons exchanged between atoms that provide power to our cells and our whole body and mind. Real energy exists in the electromagnetic layer-in our PRANIC BODY.



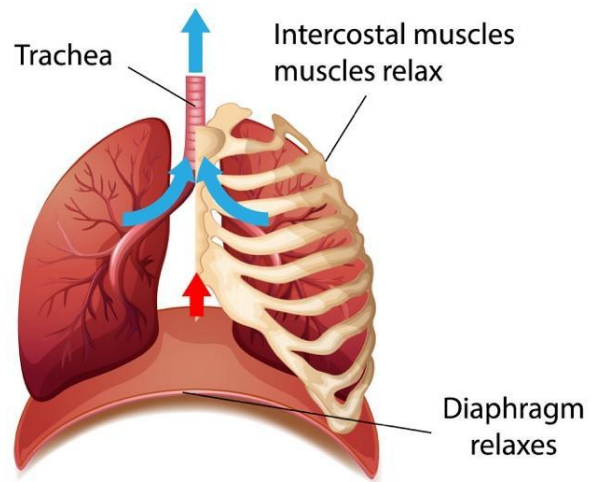
The Diaphragm - our main breathing muscle



- Separates the thorax from the abdomen
- Dome shaped muscle
- 3-5 cm thick
- Performs up to 80% of breathing
- Has holes for blood vessels and the oesophagus
- It is attached to vertebra L1, the ribs and the sternum
- Innervation from cervical nerves C3, C4, C5 phrenic nerve
- Contraction moves the muscle down downwards the abdomen thorax is widening, air is sucked into the lungs
- ACTIVE INHALATION
- Relaxation allows the muscle to move upwards air is released out of the lungs
- PASSIVE EXHALATION



Inhalation



Exhalation

The movement of the Diaphragm mirrors all biological rhythms. Training the diaphragm back to its original strength is key to build a foundation and come back to natural breathing.



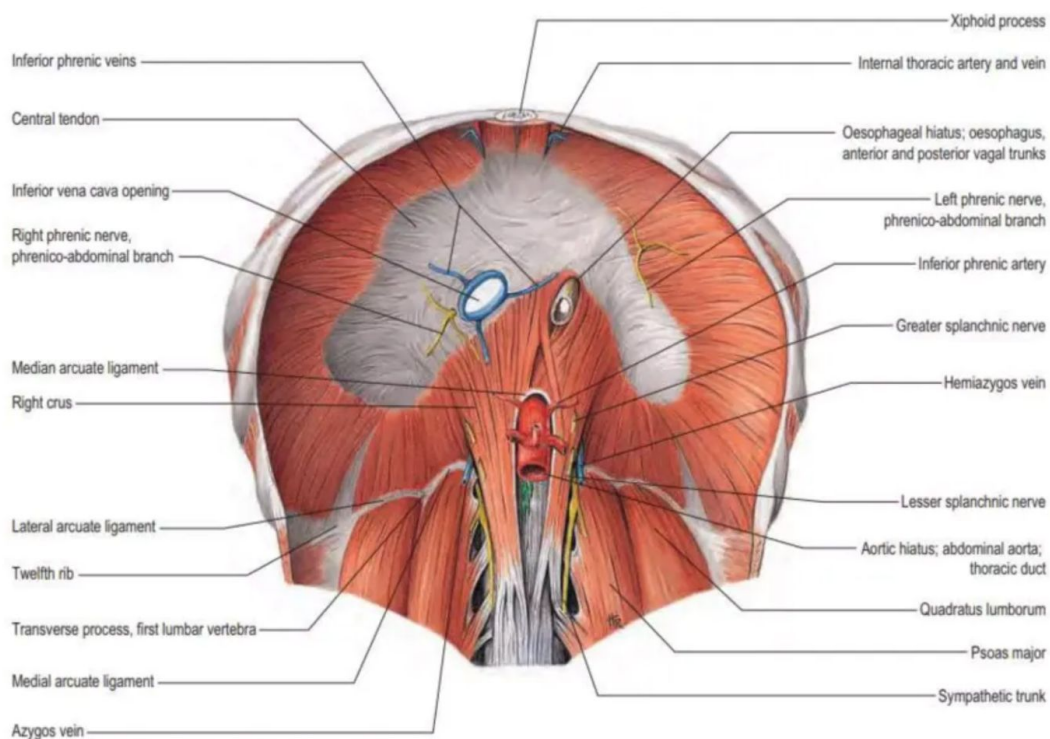
Anatomy of the Diaphragm

The lungs are attached via the pleura to the ribcage and do not have muscles. They move via the breathing muscles:

- **The Diaphragm** pulls air into the lungs in relaxed breathing **(80%)**
- The intercostal muscles expand of the ribcage for intense breathing and **(20%)**
- The accessory inspiratory muscles **only** for heavy breathing.

Like we have hemispheres in the brain, also the diaphragm has 2 sides.

Both hemispheres have a circular muscle tissue and a broad tenon in the middle, which is attached to the lungs and pulls them from there. The muscular part is connected to the Pleura which moves the passive lungs.



The Diaphragm has sternal (inside of the sternum), lumbar (L1-L3) and a costal connections (cartilage and ribs 7-12). It serves as a barrier between the upper and the lower body but also functions as a communicator between different them. The nerve supply of the diaphragm originates from C3 C4 and C5 (phrenic nerves) and the intercostal nerves 6-11.



Train the Diaphragm and induce self-regulation

1. Massages stomach, colon, pancreas, gall bladder, liver, ovaries, oviduct, uterus, bleb, prostate gland and the base of the heart
2. Increases oxygen supply to the organs
3. Helps transporting digestive juices right PH - values
4. Supports colon motility
5. Speeds up the digestion
6. Releases cramps
7. Helps harmonizing abdominal flora (fungi, bacteria, viruses)
8. Brings the Vagus nerve back into the right direction of function
9. Brings energy to the sexual organs
10. Regulates sexual fluids
11. Increases the lung volume
12. Improves the quality of breath
13. Improves physical performance
14. Trains the main breathing muscle
15. Helps detoxing all abdominal organs
16. Activates the parasympathetic nervous system
17. Calms the mind
18. Improves being centred and focussed
19. Improves mental function (memory, learning, body-mind-integration)
20. Increases awareness

Breathe well - live long

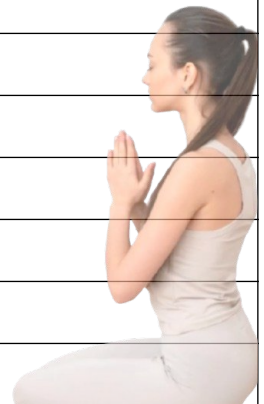
Being	Average Breath-Rate	Average Lifespan in Years
Giant Tortoises	4	200
Crocodile	6-10	100
Elephants	8	80
Humans	15-20	75
Cats and Dogs	25	16
Mice	130	2



Qualities of Breath

To refine the qualities of the breath is key to Yogic practice and a precursor to activating Shushumna Nadi. Observing the qualities of Yogic breathing supports health, prevents illness and is connected to prolonged lifespan.

HEALTHY	UNHEALTHY
Diaphragmatic	Chest
Continuous	Interrupted
Deep	Shallow
Slow	Fast
Free, no obstacles	Pressed
Regular	Irregular
Soundless	Noisy
No jerks	Jerky
Smooth	Rough
Nasal	Oral
Inhalation Exhalation	Inhalation > Exhalation



Our breathing quality interacts directly with various physiological processes. Via our double-feedback-system, we can influence the biochemistry of our body via breath modulation and change our nervous activity. The output is measurable in hormone levels, brainwave patterns, muscle tension, heart beat variability and psycho-emotional states as well as behaviour. While the Health benefits of diaphragmatic breathing are numerous, they are all connected to basic physical functions.





Physiological Long-term Effects of breathing patterns

Effects of Yogic healthy breathing	Effects of unhealthy breathing
Faster cell to cell communication and healing	Diminished cell-repair and healing
Increased DNA repair	Increased DNA damage
Alkaline blood and body liquids	Acidity
Stronger detoxification	Lack of detoxification
Higher pain-resilience	Higher levels of pain
Oxygenized body tissues	Lack of oxygen
Higher stress-resilience	Less resilience (body and mind)
Increased neurogenesis	Increased brain cell deterioration
Improves sleep quality	Reduces sleep quality
Quicker muscle building	Muscle deterioration
Hydrated soft tissues, tendons and ligaments	Dehydration
Balanced hormone system	Hormone imbalances
Fosters fertility	Diminished fertility
Strong immune system	Dysfunctional immune system
Growing mental capacities	Reduced mental capacities
Higher CO2 tolerance	Less CO2 tolerance
Decreased heart-rate	Increased heart-rate
Slower metabolism	Increased metabolism
Lower blood-sugar levels	Higher blood-sugar levels
Less need for sleep	More need for sleep
Wider brain-heart arteries	Constricted brain-heart arteries
Higher O2 levels in the brain	Lower O2 levels in the brain
Lowers cardiovascular risk	Increased cardiovascular risk
Improves lymphatic flow	Reduces lymphatic flow



Psychological long-term effects of breathing patterns

Increased emotional stability	Less emotional stability
Increased confidence	Decreased confidence
Less affected by objective stressors	More affected by objective stressors
Less psychosomatic diseases	More psychosomatic diseases
Higher creativity	Lack of creativity
Increased intuition	Reduced intuition

Ashwini Mudra and the activation of Relaxation – Horse Mudra

The rectum is directly connected to the brainstem-our seat of survival instincts via the autonomic nervous system. Inducing the Parasympathetic qualities of the ANS with Ashwini Mudra signals relaxation to our brain and helps to reduce prefrontal cortex nervousness, overthinking and projections. Constipation in the rectum equals mental constipation and is a sign of prolonged stress exposure. Watch out for defecation in depressed people!



Horse’s defecation: Rectum turns inside out for defecation and gets sucked back in. The anus remains clean. Psycho-physical aspects: Increases digestion and improves peristalsis. Reduces constipation.



Psycho-physical aspects

Increases digestion and improves peristalsis. Reduces constipation.



Asana

- Ashwa-sanchalanasana
- Opens the chest for more lung volume.
- Stretches the stomach meridian and improves digestion.

Ayurveda:

Ashwagandha=Smell of the horse. Induces sleep, relaxation, improves memory, concentration and fertility, reduces anxiety and stress. Increases resilience and triggers testosterone.



Vedic scriptures: Ashwa translates into Energy-our Psycho-Physical Connection. How the Atman resides in the body.

