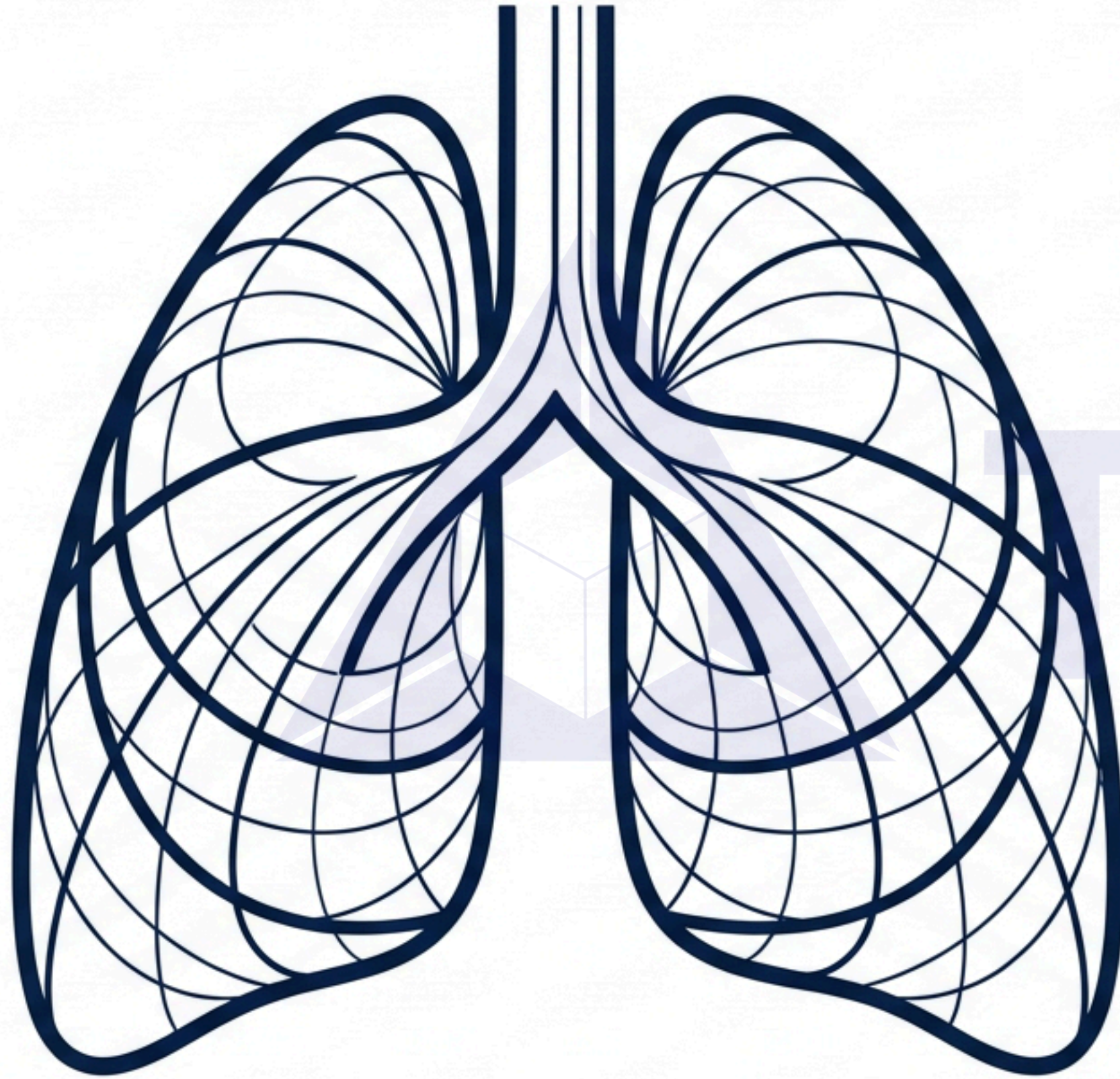


CHAPTER 14.2



How Pressure Moves Air

The Mechanics of
Human Breathing

The Breathing Cycle



Atmospheric air is drawn into the lungs.

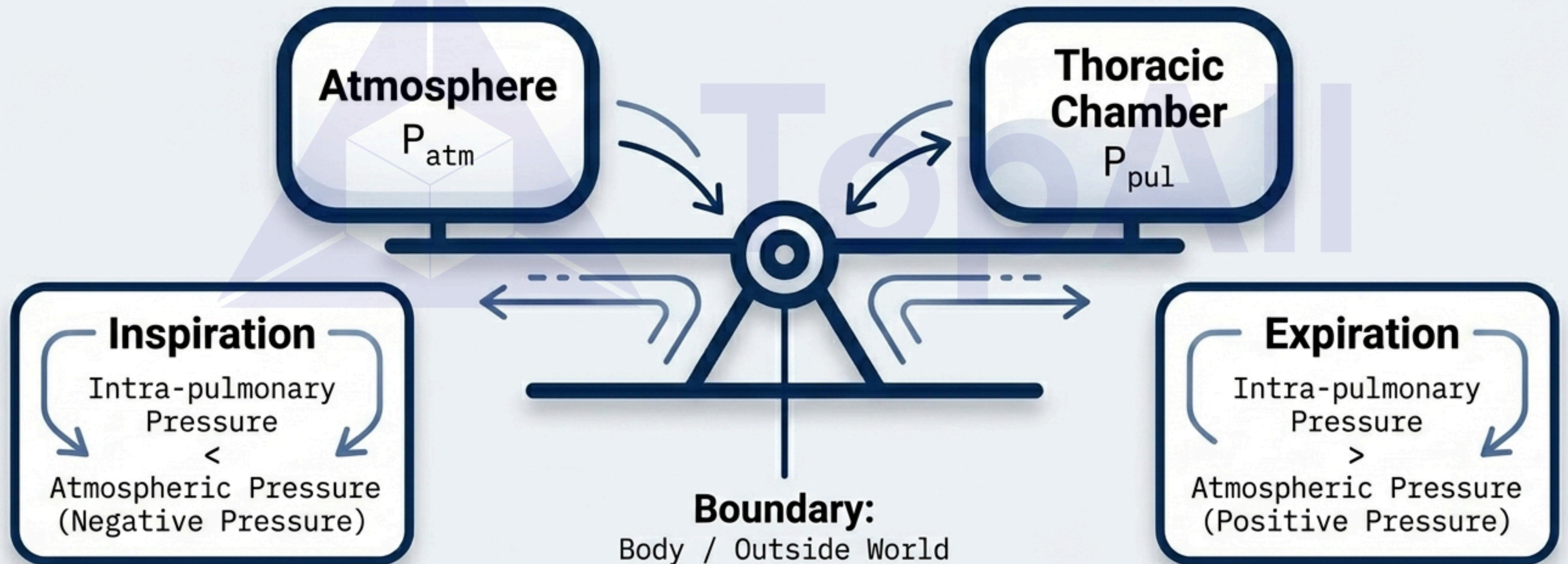


Alveolar air is released out of the lungs.

A healthy human executes this cycle 12-16 **times per minute**.
Volume changes can be clinically measured using a spirometer.

The Pressure Gradient

Air movement is dictated entirely by a pressure gradient. Because the thoracic chamber is anatomically air-tight, altering its volume directly alters intra-pulmonary pressure. We do not pull air; we manipulate internal pressure.





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$$E=mc^2$$



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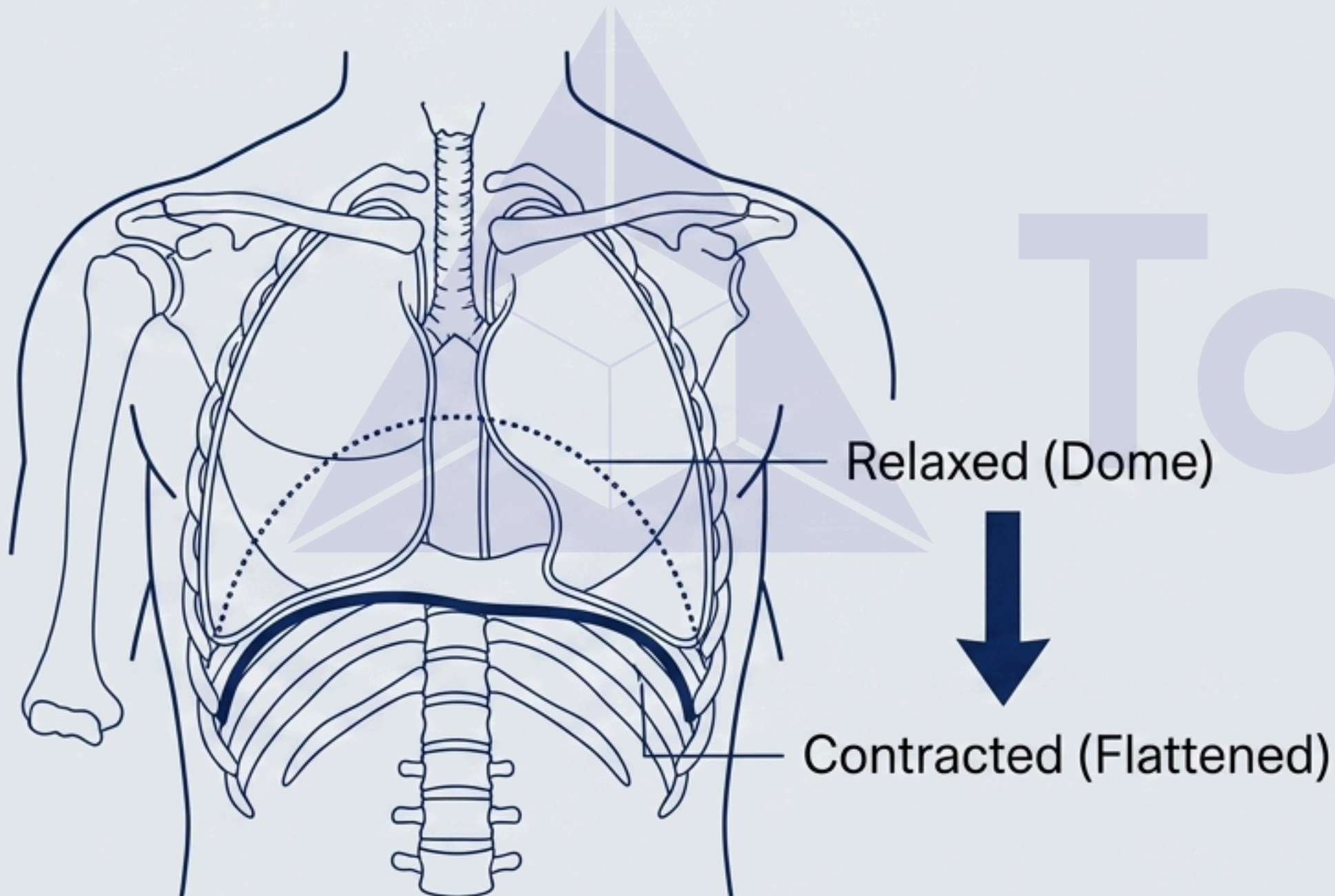
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Actuator 1: The Diaphragm

Inspiration is initiated by a specialized dome-shaped muscle at the base of the thoracic chamber.



Diaphragm Contracts



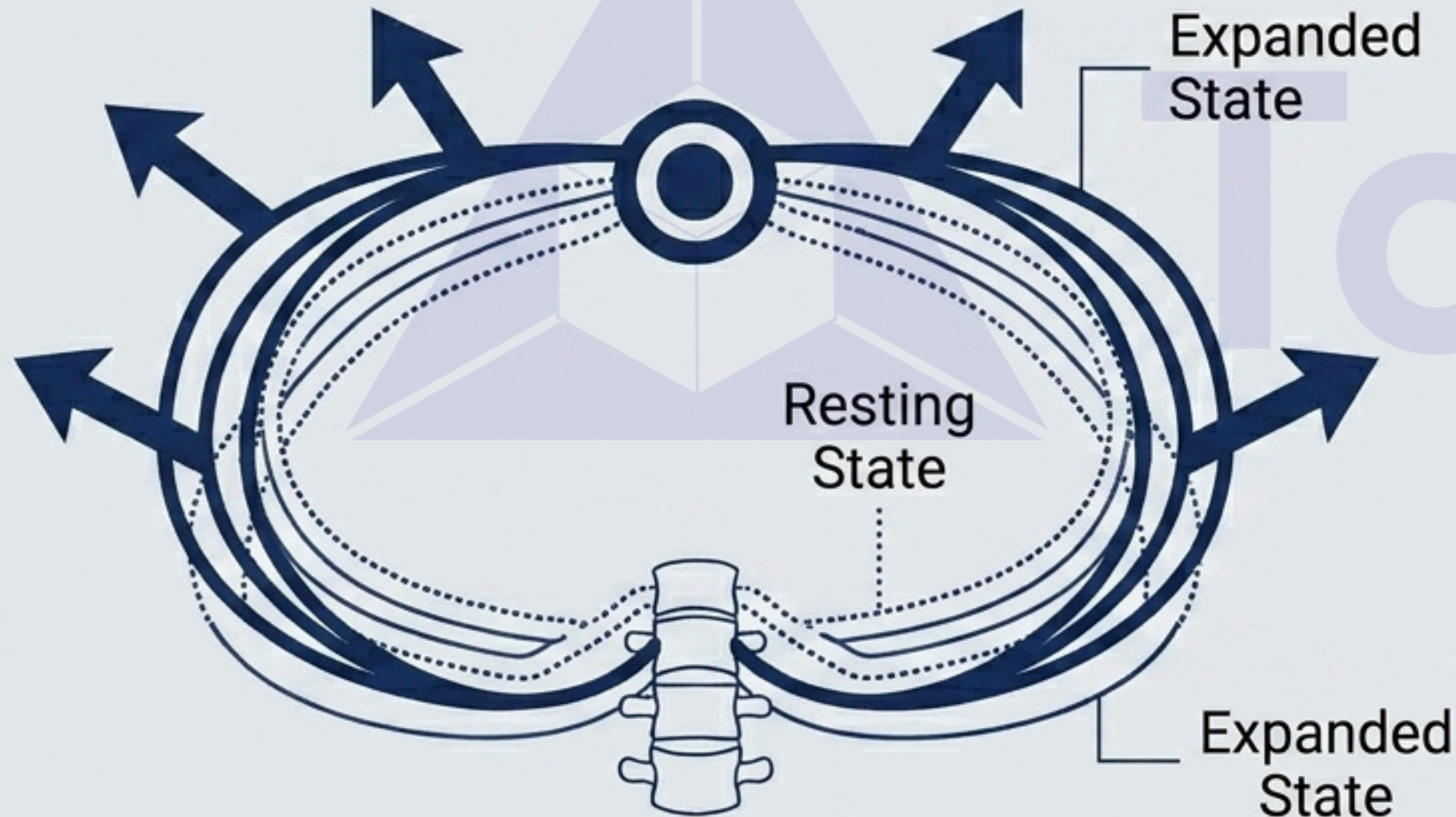
Flattens Downward



Increases volume in the
antero-posterior axis

Actuator 2: Intercostals & Ribs

Working in tandem with the diaphragm, a specialized set of external intercostal muscles between the ribs handle the second axis of expansion.



External Intercostals Contract



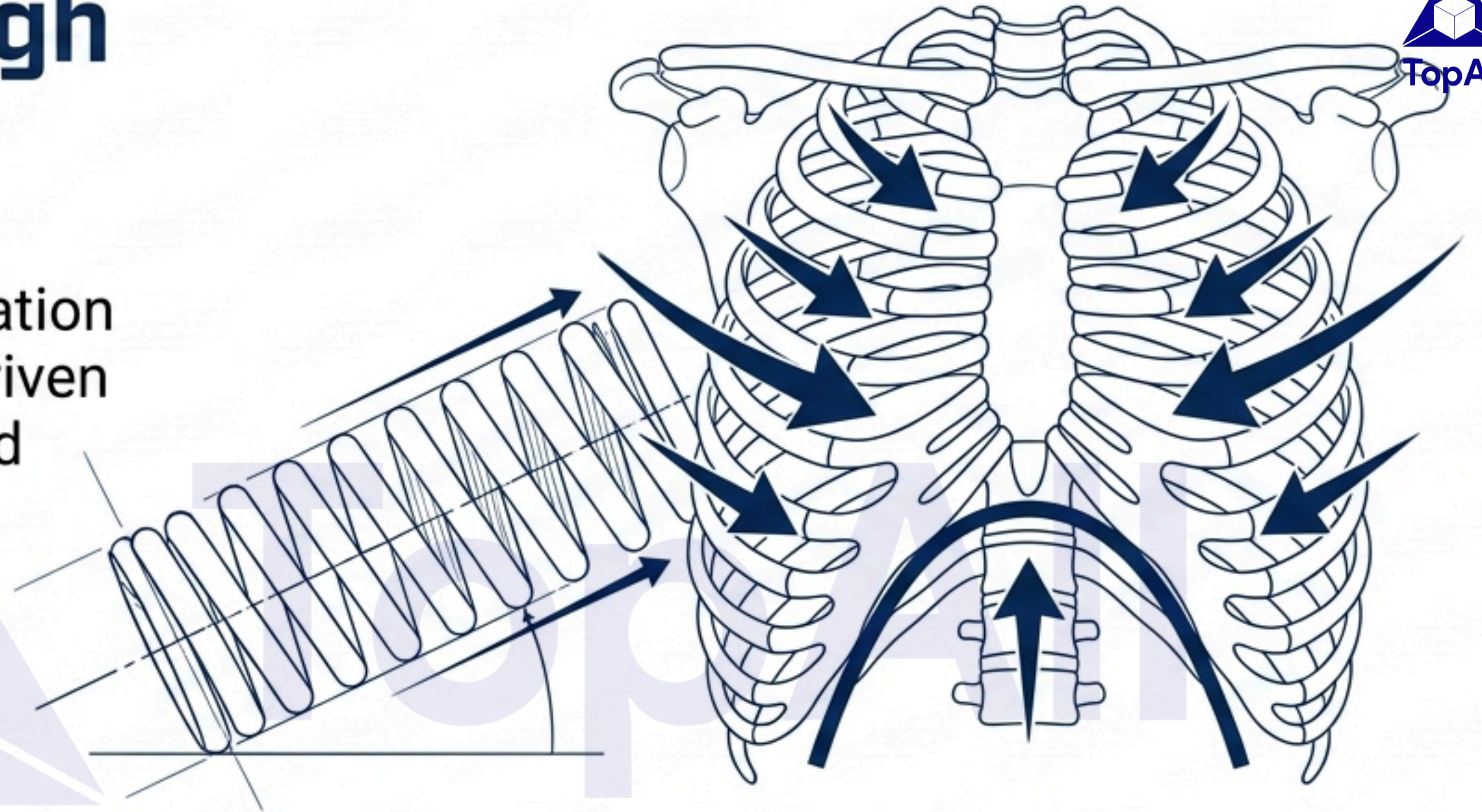
Ribs & Sternum Lift



Increases volume in the dorso-ventral axis

Expiration Through Relaxation

Unlike inspiration, normal expiration is a passive physical process driven by the relaxation of muscles and the natural elasticity of the lungs.



Muscles
Relax

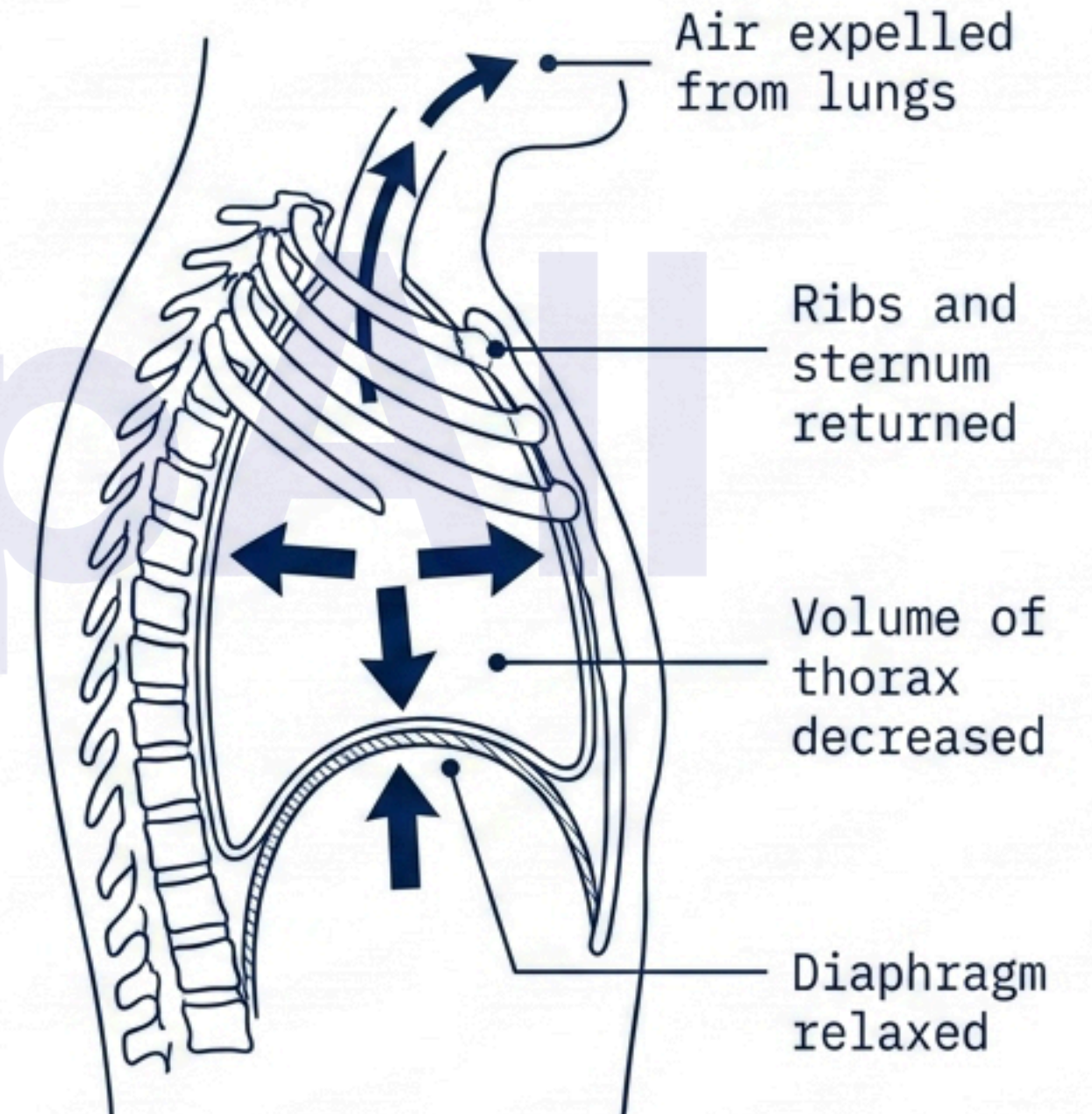
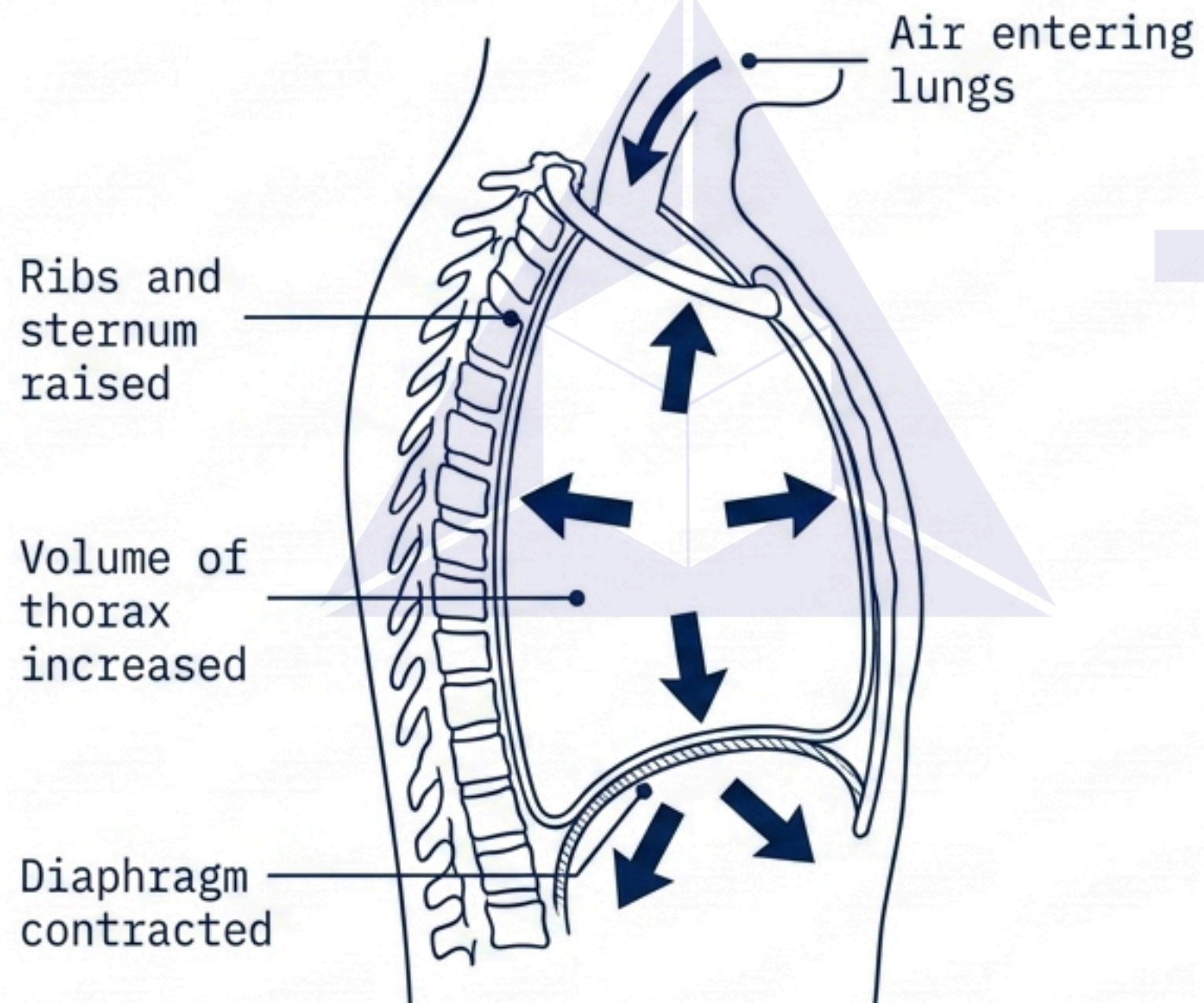
Diaphragm &
Sternum
return to
baseline

Thoracic
volume
decreases

Intra-
pulmonary
pressure
rises

Air is
expelled

The Mechanism in Action



Core Insight

Breathing relies on an anatomical masterstroke: the lungs are housed in an air-tight thoracic chamber. By actively using muscles to expand the physical dimensions of the chamber, the body indirectly expands the lungs. *We do not pull air; we simply make room for it, allowing atmospheric pressure to do the rest.*



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