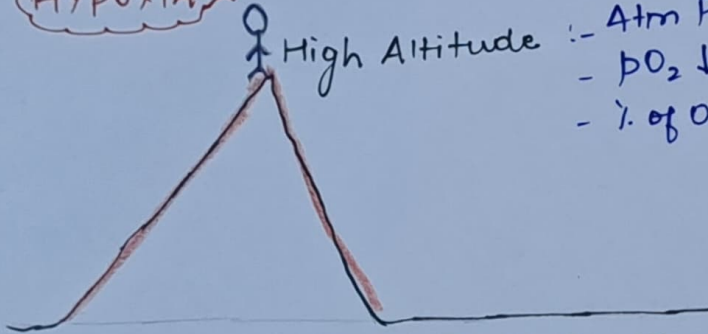


HIGH ALTITUDE PHYSIOLOGY

HYPOXIA

High Altitude :-
 - Atm Press ↓
 - pO_2 ↓
 - % of O_2 (N)

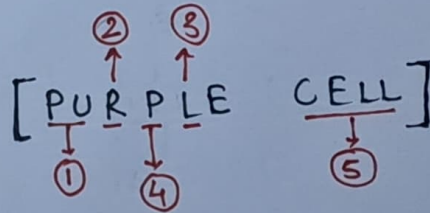


Physiological adaptation
to new altitude



ACCLIMATIZATION

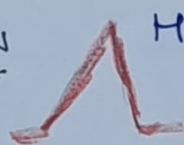
- ① ↑ in pulmonary ventilation
- ② ↑ in no. of RBC's
- ③ ↑ diffusing capacity of lungs
- ④ ↑ vascularity of peripheral tissues



Sea Level :- Atm Press = 760 mmHg (1 atm)
 - 21% O_2
 - pO_2 = 160 mmHg

- ⑤ Cellular acclimatization [↑ ability of tissues to use O_2 despite low pO_2]

VENTILATION



Hypoxemic hypoxia

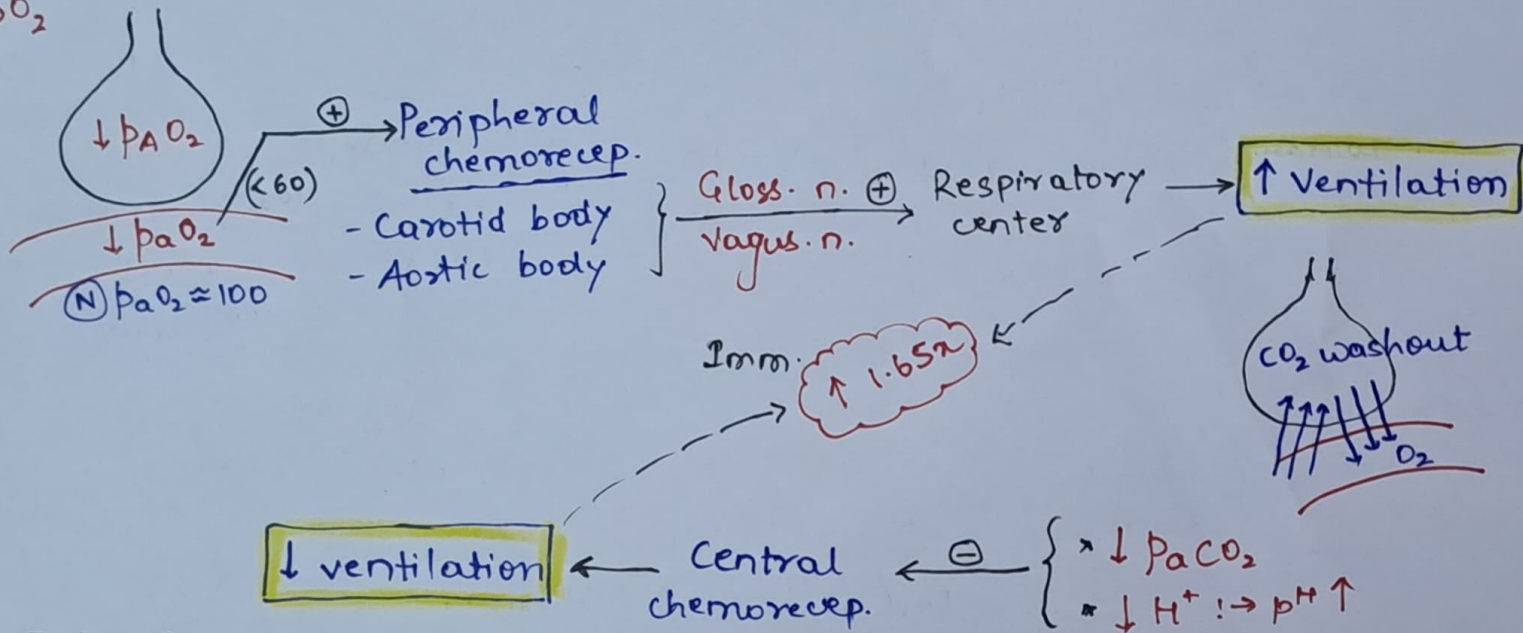
Immed. →

↑ ventilation
(1.65x)

after
2-5 days →

↑ ventil.
(5x)

↓ pO₂



2-5 days



H⁺ excretion ↓
HCO₃⁻ exc. ↑ } Blood
H⁺ ↑
(pH: -N)

Inhibition from
central chemorec.
lost.

↑↑ ventilation
(5x)

↑ no. of RBC

Hypoxia Inducible Factor :- AKA :- **MASTER SWITCH** of Hypoxia.

HIF

→ DNA binding transcription factor

{ Normal :- Downregulated
Hypoxia :- Upregulated }

HYPOXIA ⊕
↓

✓ Erythropoietin gene ⇒ ↑ EPO → ↑ RBC production

✓ VEGF gene
(Vasc. Endoth. Growth factor) ⇒ Angiogenesis → ↑ Vascularity

✓ Mitochondrial gene ⇒ ↑ cellular oxidation despite low P_{O_2} → Cellular acclim.

✓ Genes of glycolytic enzymes ⇒ ↑ 2,3-DPG ⇒ Rt. shift of O_HDC (↓ affinity of O_2)
↓
More release of O_2 to tissues

✓ Genes increasing NO ⇒ Pulmonary vasodilation

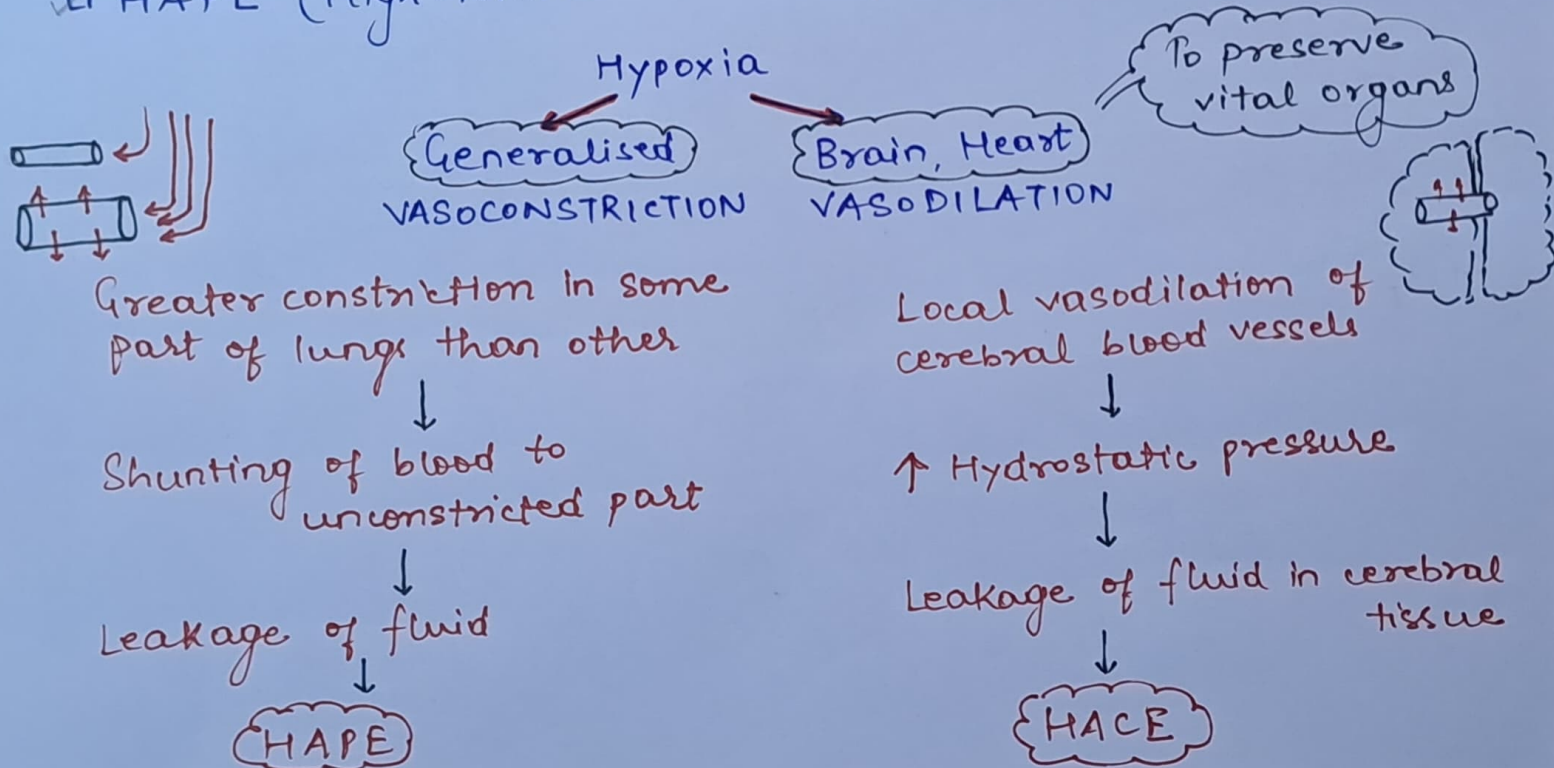
ACUTE MOUNTAIN SICKNESS

(D/t rapid ascend to high altitudes)

From:- Within 2 hrs
To:- upto 2 days

Effects:-

- ✓ HACE (High Altitude Cerebral Edema)
- ✓ HAPE (High Altitude Pulmonary Edema)



FEATURES

- 1) Cough & Blood in Sputum
- 2) Headache
- 3) Inability to walk
- 4) Cyanosis
- 5) Congestion of chest
- 6) Confusion
- 7) Consciousness ↓
- 8) Dyspnea

[Bloody Head in CCCCD]

Prevention & Tx :-

- * Descend to lower altitude
- * Slow ascent to facilitate acclimitiz
- * O₂ therapy
- * CCB (Nifedipine)
- * Dexamethasone

CHRONIC MOUNTAIN SICKNESS :-

(High Altitude for long duration)

Effects :-

* $\uparrow$ RBC
 $\uparrow$ Hematocrit

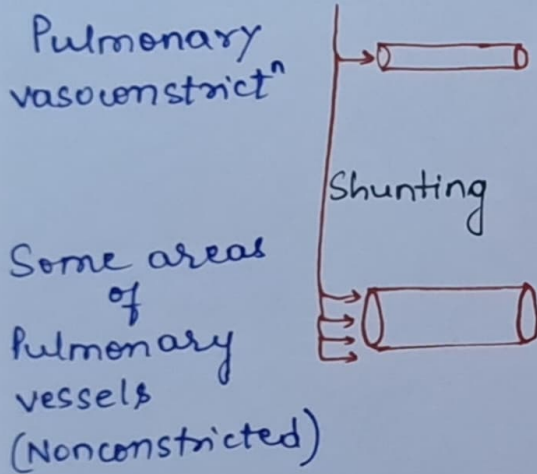
$\rightarrow \uparrow$ Blood viscosity

$\rightarrow \downarrow$ Blood flow
① $\downarrow$ O_2 delivery

$$\left[R = \frac{8\eta L}{\pi r^4} \right]$$

viscosity
 $\downarrow$ Resistance

* Hypoxia



Prolonged Hypoxia

Complete pulmonary vasoconstriction

(Pulmonary HTN)

② $\uparrow$ pulmonary arterial pressure

③ Rt. Side Congestive Heart failure

④ Death.

Tx :- Lower Altitude ; Acetazolamide.