

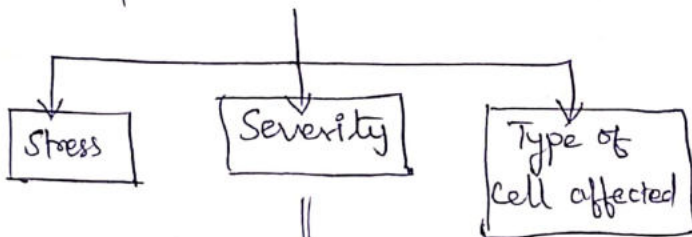
Stress.

↓ ~~leads to~~ makes the
Cells to adapt via
"GROWTH ADAPTATIONS"

But if stress exceeds the
cell's ability to Adapt

↓
Cell gets injured.

Likelihood of injury
depends on ③ factors



for eg: **Renal artery**

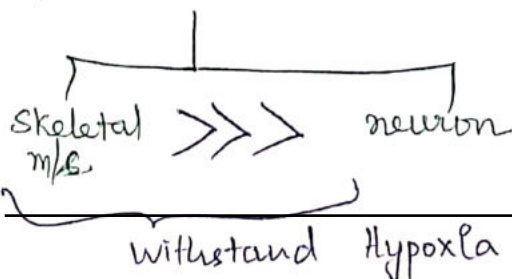
Slow cutting off
blood supply bcz
of Atherosclerosis
(or) fibroms
dysplasia

↓
**Atrophy of
kidney**

block
(acute)
by an
emboli

↓
**Infarction
of kidney**

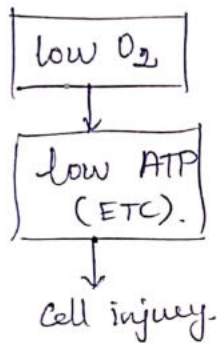
Type of cell.



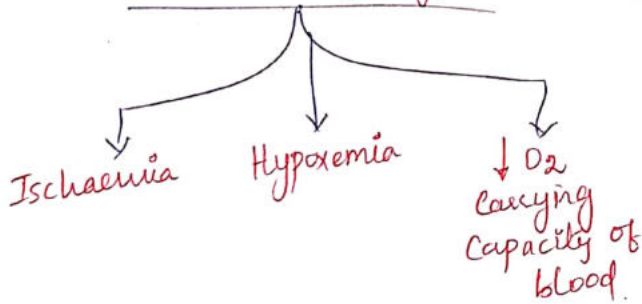
- i) Inflammation.
- ii) Nutritional deficiency/excess.
- iii) Hypoxia ⊗
- iv) Trauma
- v) Genetic mutations

Hypoxia :

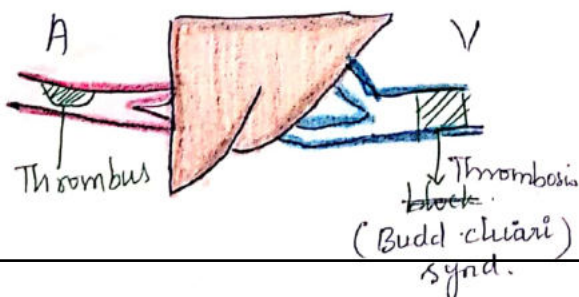
* low O₂ (delivery) to tissue



③ causes of Hypoxia



① Ischaemia ↓ blood flow thro' an organ



Thrombosis of Hepatic V.

m/c cause:

i) polycythemia vera

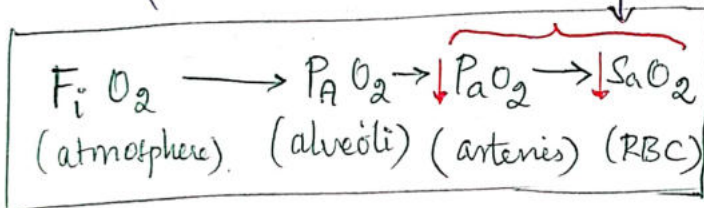
ii) Lupus pt.

iii) shock.

2) Hypoxemia

low PO_2 in blood

($PO_2 < 60 \text{ mm Hg}$),
($SO_2 < 90\%$).



eg: 1) At High Altitude

$F_i O_2 \downarrow \rightarrow P_A O_2 \downarrow \rightarrow P_a O_2 \downarrow \rightarrow S_a O_2 \downarrow$

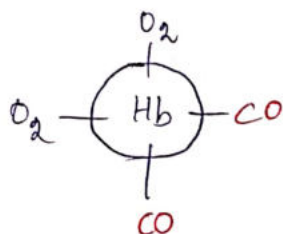
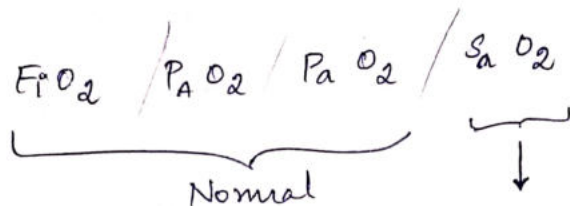
2) Hypoventilation, COPD

$\downarrow P_A O_2$
 $\uparrow P_A CO_2$] $\rightarrow \downarrow P_a O_2 \rightarrow \downarrow S_a O_2$

3) $\downarrow O_2$ Carrying Capacity arises with Hb loss/dysfunction.

eg: 1) Anemia ($\downarrow$ in RBC mass)

$\downarrow \downarrow$
 $P_a O_2$ & $S_a O_2$ normal.



Causes:

- (i) Smokes from fires
- (ii) exhaust from cars.
- (or) gas heaters.

Classic finding: (CF).

CHERRY RED APPEARANCE of Skin.

↓
 bcoz Hb is so tightly bound to CO.

Sign:

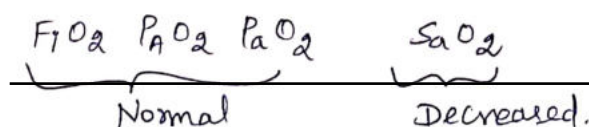
early sign - Headache

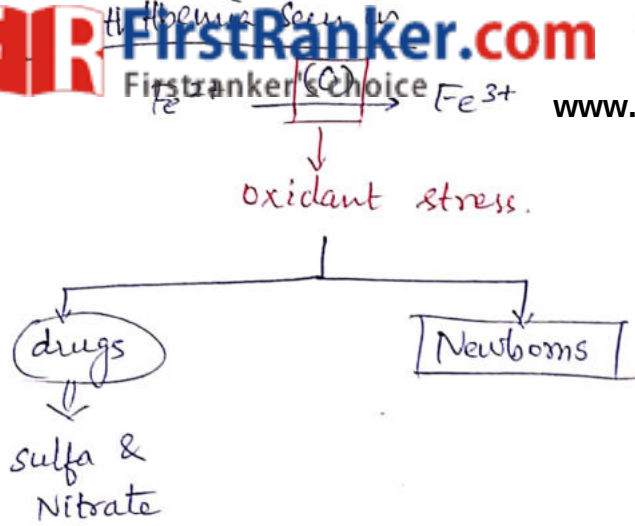
Signif. exposure - Coma & death

(iii) Methemoglobinemia

* iron in Hb → Fe²⁺ (Normally).
 ↓
 binds with O₂

* If Fe²⁺ → (O) → Fe³⁺





Physiologically

* low conc. of Met-Hb is present & formed

But continuously reverted back to Normal Fe^{2+} by certain enzymes.

These enzymes not well developed in Newborns

Met-Hb in newborns

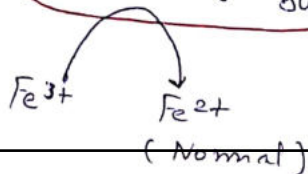
Classic finding: (CF).

☐ chocolate Coloured blood.

Cyanotic.

Treatment:

IV methylene blue.



Hypoxia

impairs Oxid. phos.

decreased ATP prodⁿ

low ATP disrupts cellular functions:

- * $\text{Na}^+ - \text{K}^+$ pump
- * Ca^{++} pump
- * Aerobic glycolysis.

* $\text{Na}^+ - \text{K}^+$ pump

$\text{Na}^+ \uparrow$

$\rightarrow$ Na^+ accumulatⁿ,
cell swells & can burst

* Ca^{++} pump

$\text{Ca}^{++} \uparrow$

$\rightarrow$ High "cytosolic" Ca^{++}
 $\downarrow \oplus$
unnecessary enzymes.

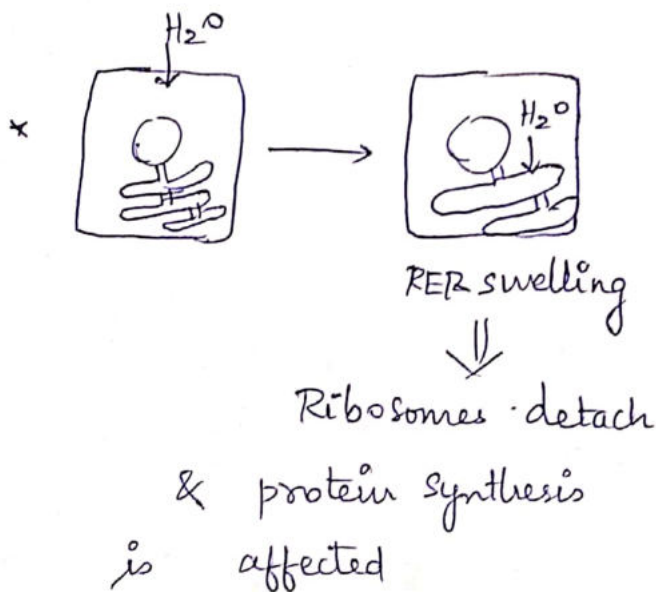
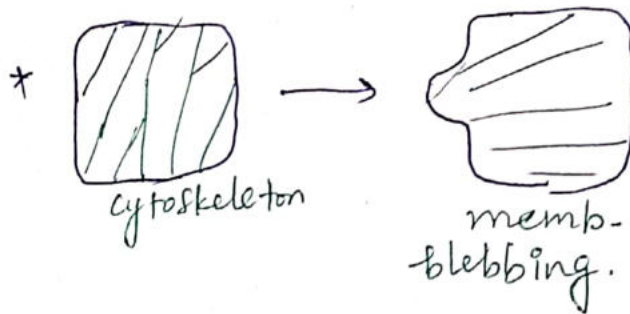
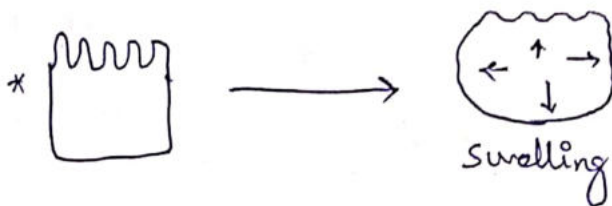
* Aerobic glycolysis

$\rightarrow$ (i) low ATP
(ii) Lactic a $\rightarrow$ $\text{pH} \downarrow$
 $\downarrow$
precipitation of DNA
& proteins.

"reversible" with following

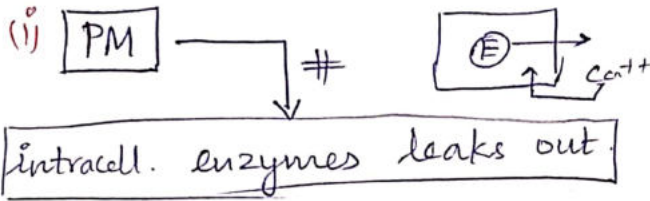
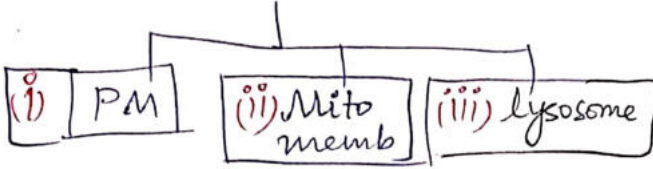
features:

- (i) Cellular swelling [key principle]
- (ii) * loss of microvilli,
* membrane blebbing,
* swelling of RER.



Hallmark is Membrane
damage.

③ memb. of cell



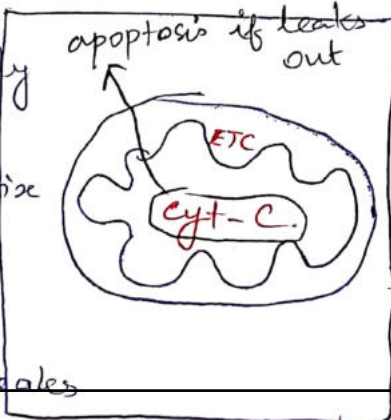
eg: In Myocardial infarcⁿ,
irrev. damage occurs &
Troponin leaks out.

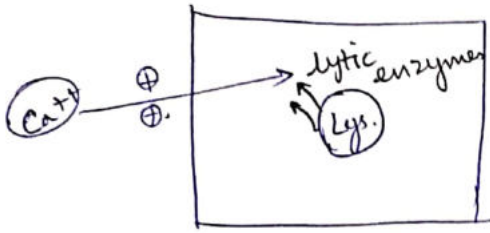
&
Also Ca^{++} enters inside cell.

(ii) Mitochondrial memb

* ETC. ← #
impaired.
(ATP can't be produced
even when suff. O_2 is
present),
&

* Cyt-C
is carefully
restricted
to mito. matrix
so if
damage
occurs,
Cyt-C. leaks
& causes APOPTOSIS.





* lytic enzymes released.

* which are activated
by Ca^{++}

End Result: CELL-DEATH.