

HYPOXIA

Def:- Decreased availability of oxygen to tissues in body

Classification:-

- A) Hypoxic Hypoxia
- B) Anaemic Hypoxia
- C) Stagnant (Ischaemic) Hypoxia
- D) Histotoxic Hypoxia.

HYPoxic HYPoxIA :-

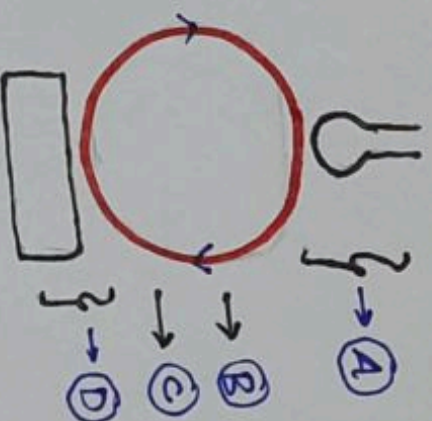
• Characteristic features:-

- i) $\downarrow$ arterial pO_2
- ii) $\downarrow$ arterial O_2 content
- iii) $\downarrow$ arterial % O_2 -saturation of Hb
- iv) $\downarrow$ A-V pO_2 difference

pO_2	100(a)	40(v)	55(a)	25(v)
% Sat. of O_2	97% (a)	75% (v)	85% (a)	45% (v)
O_2 content	19(a)	14(v)	14(a)	9(v)
A-V pO_2 diff.	100-40 = 60		55-25 = 30	

NORMAL

HYPoxic HYPoxIA



• Causes:-

I.) Low pO_2 in inspired air

- High altitude
- Breathing in closed space.

II.) Decreased pulmonary ventilation

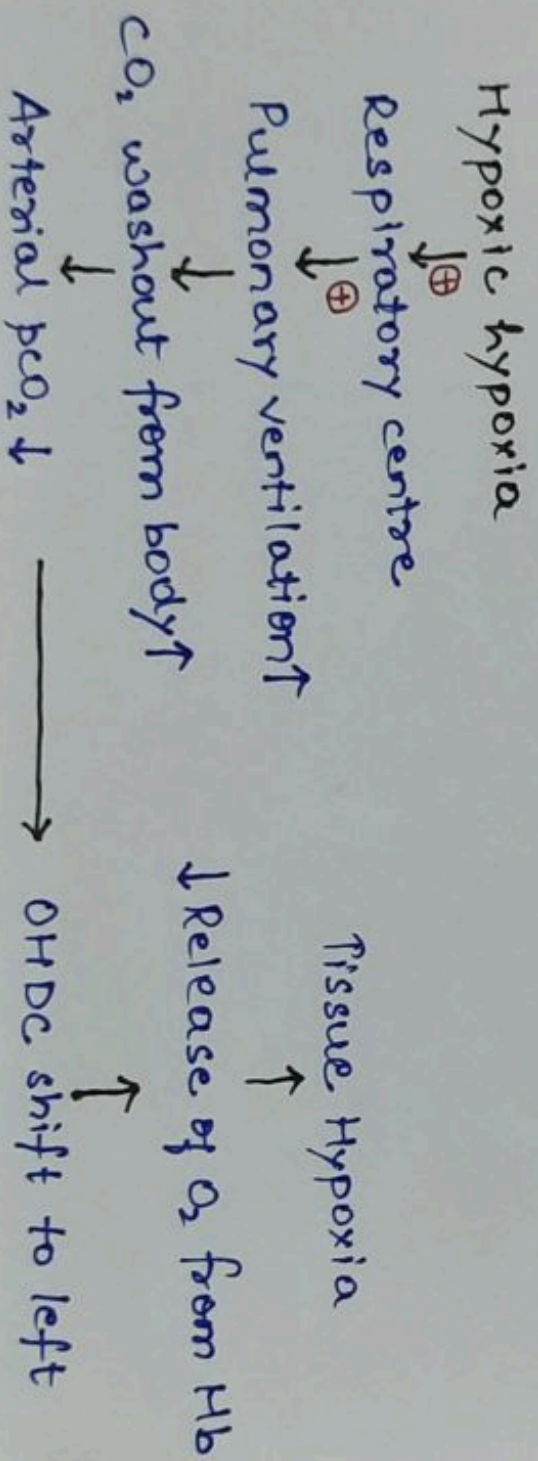
- Airway obstruction
- Weakness/paralysis of respiratory muscles
- Depression of respiratory muscles

III.) Defect in gaseous exchange

IV.) Venous-arterial shunts

- Cyanotic congenital heart disease (Fallot's tetralogy)

• Pathophysiology:-



ANAEMIC HYPOXIA :-

↳ Arterial pO_2 is NORMAL
 ⇒ Amount of Hb available to carry O_2 is reduced.

Characteristic features :-

- i) Arterial pO_2 Normal
- ii) Arterial O_2 content Normal / ↓
- iii) Arterial % O_2 saturation of Hb ↓
- iv) A-V pO_2 difference - Normal
- v) A-V % O_2 sat. of Hb difference → ↑

Art.	Ven.
100	40
10	5
60%	20%

60
40%

Causes :-

I) Anaemia

II) Hge

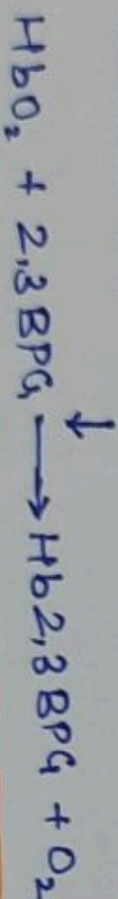
III) conversion of Hb to abnormal Hb

↳ Met-Hb
 ↳ Carboxy-Hb

Pathophysiology :-

At Rest -

Anemia ⇒ ↑ 2,3BPG in RBC's



↑ Liberation of O_2 ⇒ Hypoxia is not severe

Exercise -

O_2 demand >> Liberation of O_2

⇓

Severe Hypoxia develops

STAGNANT (ISCHAEMIC) HYPOXIA :-

↳ ↓ Blood flow to tissues

Adequate O_2 not delivered @ tissues.

• Characteristic feature :-

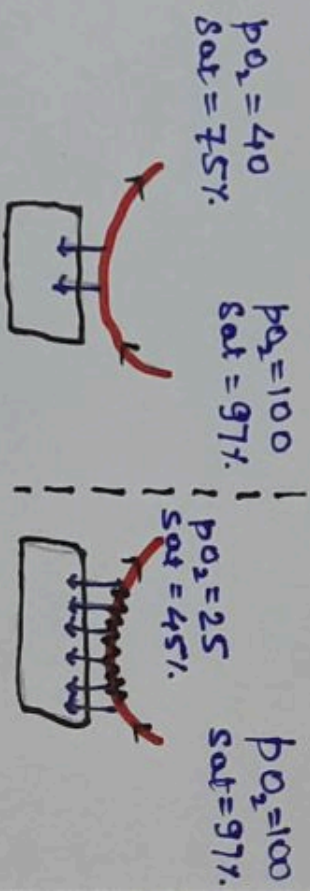
- i) Arterial pO_2 - Normal
- ii) Arterial O_2 content - Normal
- iii) % O_2 sat. of Hb - Normal
- iv) A-V pO_2 difference - ↑
- v) A-V % O_2 sat. of Hb difference - ↑

• Causes :-

i) Circulatory failure

ii) Hge

iii) Congenital heart failure.



HISTOTOXIC HYPOXIA :-

↳ Inadequate utilisation of O_2 by tissues supplied to them.

• Characteristic features :-

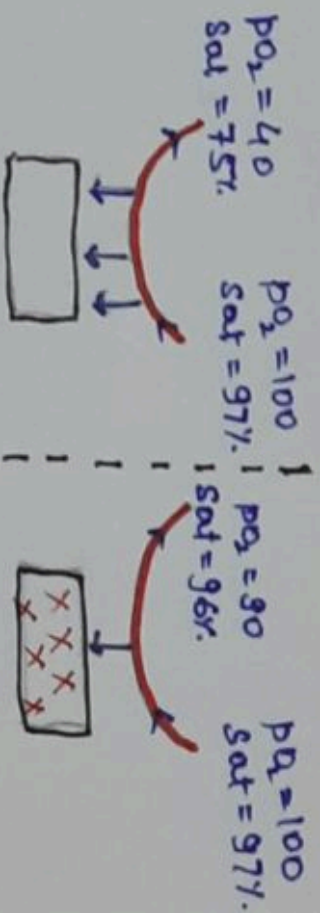
- i) Arterial pO_2 - Normal
- ii) Arterial O_2 content - Normal
- iii) % O_2 sat. of Hb - Normal
- iv) A-V (pO_2) difference - ↓
- v) A-V (% O_2 sat. of Hb) difference - ↓

• Causes :-

I) Cyanide poisoning (damage to cyt. oxidase)

II) Beri Beri

- * m.c. type of Hypoxia = **Hypoxic Hypoxia**
- * most potent stimulus for peripheral chemoreceptor = **Cyanide**
- * most sensitive brain area to Hypoxia = **Hippocampus**
- **Purkinje cells of cerebellum.**
- * Most resistant to Hypoxia = **Spinal cord.**



EFFECTS OF HYPOXIA :-

① On RESPIRATION

- All hypoxia (except anemic hypoxia) stimulates peripheral chemoreceptor.

↓

↑ Respiration.

② On CNS

- Brain is affected first

- Overdose of Alcohol like symptoms

- Drowsiness
- Depression / Excitement
- Headache
- Disorientation
- Emotional outburst of laughing, shouting.

③ On CVS

Hypoxia (except anemic)

↓ ⊕

Peripheral chemo.

⊕

→ VMC

⇒

↑ HR, ↑ BP

⊕

→

Resp. centre

⇒

↑ rate & depth of respiration.

④ Others

- Nausea, vomiting
- Anorexia.

TREATMENT OF HYPOXIA

Tx of underlying cause

OXYGEN TOXICITY

100% O₂ ⇒ w/o monitoring

↓ in Respiration

8 hrs → Irritation in respiratory passage

>24 hrs → Bronchopneumonia

O₂ ↑ → superoxide ions → ⊖ Macrophages
H₂O₂ ↓
Bact. don't get killed

O₂ ↑ → ↓↓ surfactant

100% pure O₂ at atm. pressure

- Hypoxic hypoxia

100% O₂ at high pressure

"HYPERBARIC OXYGEN THERAPY"

- Anaemic hypoxia
- Stagnant hypoxia
- Histotoxic hypoxia

Newborns are more sensitive (even >40% O₂)

"RETROLENTAL FIBROPLASIA"

• Proliferation of retinal vessels & formation of fibrous tissue

PERMANENT BLINDNESS.