

## LESSON № 15

### Topic: HYPOXIA. HYPEROXIA

**Aim of the lesson:** to study causes and mechanisms of hypoxia and hyperoxia, its classification and pathogenesis.

#### QUESTIONS:

1. Normal air, alveoli and blood gas parameters.
2. Definition of hypoxia. Classification. Acute and chronic hypoxia. Exogenous and endogenous hypoxia.
3. Causes and changes of blood gas parameters ( $P_aO_2$ ,  $P_vO_2$ ,  $P_{50}$ , oxygen blood capacity,  $C_aO_2$ ,  $C_vO_2$ ,  $C_{a-v}O_2$ ,  $S_aO_2$ ,  $S_vO_2$ ,  $P_aCO_2$ ,  $P_vCO_2$ ) in:
  - a. hypoxic hypoxia;
  - b. hyperoxic hypoxia;
  - c. respiratory hypoxia;
  - d. blood-dependent hypoxia;
  - e. circulatory hypoxia;
  - f. histotoxic (tissue) hypoxia;
  - g. hypoxia of overload (overutilization);
4. Conditions that determine the susceptibility of cells to hypoxia.
5. Signs of acute hypoxia.
6. Acute and long-term adaptation compensatory mechanisms of hypoxia.
8. Conditions that determine the susceptibility of cells to hypoxia.
9. Hyperoxia.

#### Tasks

Make a conclusion about blood gas values

№ 1	№ 2
$P_{atm}O_2$ – 160 mm Hg	$P_{atm}O_2$ – 158 mm Hg
$P_{alv}O_2$ – 105 mm Hg	$P_{alv}O_2$ – 105 mm Hg
$PaO_2$ – 96 mm Hg	$PaO_2$ – 95 mm Hg
$PvO_2$ – 60 mm Hg	$PvO_2$ – 38 mm Hg
$PaCO_2$ – 30 mm Hg	$PaCO_2$ – 40 mm Hg
$SaO_2$ – 98 %	$SaO_2$ – 70%
$SvO_2$ – 91%	$SvO_2$ – 20%
Pulmonary min. volume – 7.3 l/min	MetHb – 40%
Circulation min. volume – 6.9 l/min	Pulmonary min. volume – 8.8 l/min
pH – 7.31	Circulation min. volume – 7.0 l/min

Lactic acid – 26.5 mg/dl

№ 3

$P_{\text{atm}}\text{O}_2$  – 150 mm Hg  
 $P_{\text{alv}}\text{O}_2$  – 94 mm Hg  
 $\text{PaO}_2$  – 76 mm Hg  
 $\text{PvO}_2$  – 21 mm Hg  
 $\text{PaCO}_2$  – 48 mm Hg  
 $\text{SaO}_2$  – 90%  
 $\text{SvO}_2$  – 32%  
Pulmonary min. volume – 4,6 l/min  
Circulation min. volume – 6,4 l/min  
pH – 7.31  
Lactic acid – 25 mg/dl

№ 5

$P_{\text{atm}}\text{O}_2$  – 105 mm Hg  
 $P_{\text{alv}}\text{O}_2$  – 55 mm Hg  
 $\text{PaO}_2$  – 40 mm Hg  
 $\text{PvO}_2$  – 12 mm Hg  
 $\text{PaCO}_2$  – 58 mm Hg  
 $\text{SaO}_2$  – 67%  
 $\text{SvO}_2$  – 11%  
Pulmonary min. volume – 4,5 l/min  
Circulation min. volume – 3,4 l/min  
pH – 7,28

pH – 7.3

Lactic acid – 20.5 mg/dl.

№ 4

$P_{\text{atm}}\text{O}_2$  – 158 mm Hg  
 $P_{\text{alv}}\text{O}_2$  – 105 mm Hg  
 $\text{PaO}_2$  – 96 mm Hg  
 $\text{PvO}_2$  – 18 mm Hg  
 $\text{PaCO}_2$  – 28 mm Hg  
Hb – 40g/l  
 $\text{SaO}_2$  – 95%  
 $\text{SvO}_2$  – 27%  
Pulmonary min. volume – 8,8 l/min  
Circulation min. volume – 2,9 l/min  
pH – 7,31  
Lactic acid – 26,5 mg/dl

№ 6

$P_{\text{atm}}\text{O}_2$  – 158 mm Hg  
 $P_{\text{alv}}\text{O}_2$  – 88 mm Hg  
 $\text{PaO}_2$  – 61 mm Hg  
 $\text{PvO}_2$  – 16 mm Hg  
 $\text{PaCO}_2$  – 59 mm Hg  
 $\text{SaO}_2$  – 88%  
 $\text{SvO}_2$  – 25%  
Pulmonary min. volume – 2,85 l/min  
Circulation min. volume – 8,5 l/min  
pH – 7,25  
Titratable acidity of the daily urine – 60 mmol/d  
Hb – 140 g/l

**LITERATURE:**

1. Lecture material.
2. General and clinical pathophysiology / ed. by A.V. Kubyshkin. – Vinnytsa: Nova Knyha Publishers. – 2011. – P. 48-59, 121-134.
3. Litvitsky P.F., Pirozhkov S.V., Tezikov E.B. Pathophysiology: Concise Lectures, test, clinic-pathophysiological situations and clinic-laboratory problems. Students manual / Moscow «Geotar-Media». – 2012. – P. 62-66.

