Relation between Circulatory system and Respiratory system

Cells undergoing metabolic processes continually use oxygen for the production of energy and in turn release carbon dioxide. Increased amount of carbon dioxide produces acidity that is toxic to the cells, so it has to be removed very efficiently and rapidly. The two system cooperate to supply O_2 and eliminate CO_2 from the body are – cardiovascular system and respiratory system. The respiratory system is responsible for gas exchange i.e., intake of O_2 and elimination of CO_2 whereas cardiovascular system transports the gases between the lungs and the cells.

The circulatory system –
The blood, blood vessels and heart together constitute blood vascular system. Heart pumps blood to various part of the body through arteries and receive it back through veins. Blood collects nutrients from the intestinal wall and oxygen from the lungs and carries it back to the heart to be distributed to the parts of the body.

The heart –
Heart is situated in the thoracic cavity between the two lungs. The heart wall consists of connective tissue, blood vessels and cardiac muscle fibres.
Human heart is 4- chambered and is divided into two halves – right and left. Each half has an upper region, auricle and lower region, ventricle.
Auricles – They are thin walled and pumps blood into the ventricles. The two auricles are separated by inter-auricular septum.
Ventricles – These are thick walled and pumps blood to the vessels for the blood supply to the entire body.
Arteries (except pulmonary artery) carry oxygenated blood from heart to various parts of the body.
Veins (except pulmonary vein) carry deoxygenated blood from tissue to the heart. Venules unite to form veins which in turn unit to form vena cava. Aorta branches to form arteries which further divide into arterioles inside the organ.

Physiology of circulation-
Right auricle receives deoxygenated blood from upper region and the lower region of the body through superior vena cava and inferior vena cava respectively. Right auricle pumps blood into right ventricle through tricuspid valve which prevents the back flow of the blood. Right ventricle pumps deoxygenated blood into pulmonary aorta which divides into right and left pulmonary arteries. Pulmonary arteries carry deoxygenated blood to the lungs for oxygenation of the blood.
The oxygenated blood from lungs returns to the left auricle by four pulmonary veins. Left auricle pumps oxygenated blood into left ventricle. Left ventricle pumps blood into systemic aorta which supplies oxygenated blood to the body organs other than lungs through arteries.

Respiratory system –
Alveoli or air sacs are the functional unit of lung. These help in exchange of gases between blood and air. **Its outer surface is covered with a network of capillaries from pulmonary artery and vein.** Lungs lie in the thoracic cavity on the both side of heart. Base of the lung is attached to diaphragm. The lungs are enclosed by a double layered membrane called pleura, filled with pleural fluid. **A lung is formed of numerous alveoli.**

Physiology of respiration –
Respiration involves inhalation, the intake of oxygen and exhalation, the release of CO_2 through the nostrils.
Inhalation occurs through the contraction of diaphragm which in turn increases the volume of thoracic cavity whereas exhalation is the outflow of air or CO_2 from the lungs occurs through the relaxation of diaphragm.

The gaseous exchange takes place between the lungs and the alveolar capillaries. The oxygen diffuses from the alveolar air to the capillary blood which is carried by pulmonary veins. The CO_2 diffuses from the alveolar capillaries into the alveolar air which is picked up by pulmonary artery. Oxygen diffuses into erythrocytes and combines with hemoglobin to form oxyhemoglobin.

The gaseous exchange between the capillaries and tissues occurs through tissue fluid. Oxygen from oxyhemoglobin diffuses from the capillary blood (pulmonary vein) to the tissue fluid and then to the tissues for cellular respiration or for metabolic activities. Simultaneously CO_2 diffuses form the tissue to the tissue fluid and then to the capillary blood (pulmonary artery), which carries the deoxygenated blood to the lungs for oxygenation.

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