



SNS COLLEGE OF ALLIED HEALTH SCIENCES
SNS Kalvi Nagar, Coimbatore - 35
Affiliated to Dr MGR Medical University, Chennai



DEPARTMENT OF CARDIO PULMONARY PERFUSION CARE
TECHNOLOGY

COURSE NAME :CARDIOPULMONARY BYPASS AND ITS COMPLICATIONS

STERILE TECHNIQUES AND SURGICAL ASEPSIS MAINTENANCE

III YEAR

UNIT : COMPLICATIONS DURING BYPASS

TOPIC : INADEQUATE OXYGEN SUPPLY



INTRODUCTION



The oxygenator is designed to add oxygen and remove carbon dioxide from the venous blood .

It used in two principal modes:

- In cardiopulmonary bypass: short term <6hours
- In extracorporeal membrane oxygenation to oxygenate blood : longer term life support >6 hours



TYPES OF OXYGENATOR

OXYGENATOR:

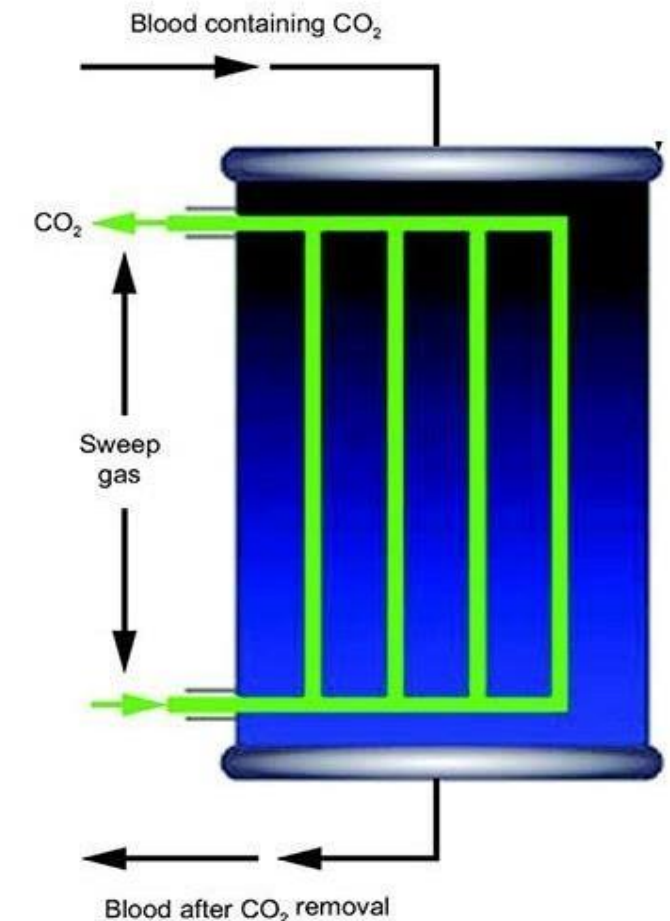
* **FILM OXYGENATOR**

- . Rotating disc oxygenator
- . Vertical screen oxygenator

* **BUBBLE OXYGENATOR**

* **MEMBRANE OXYGENATOR**

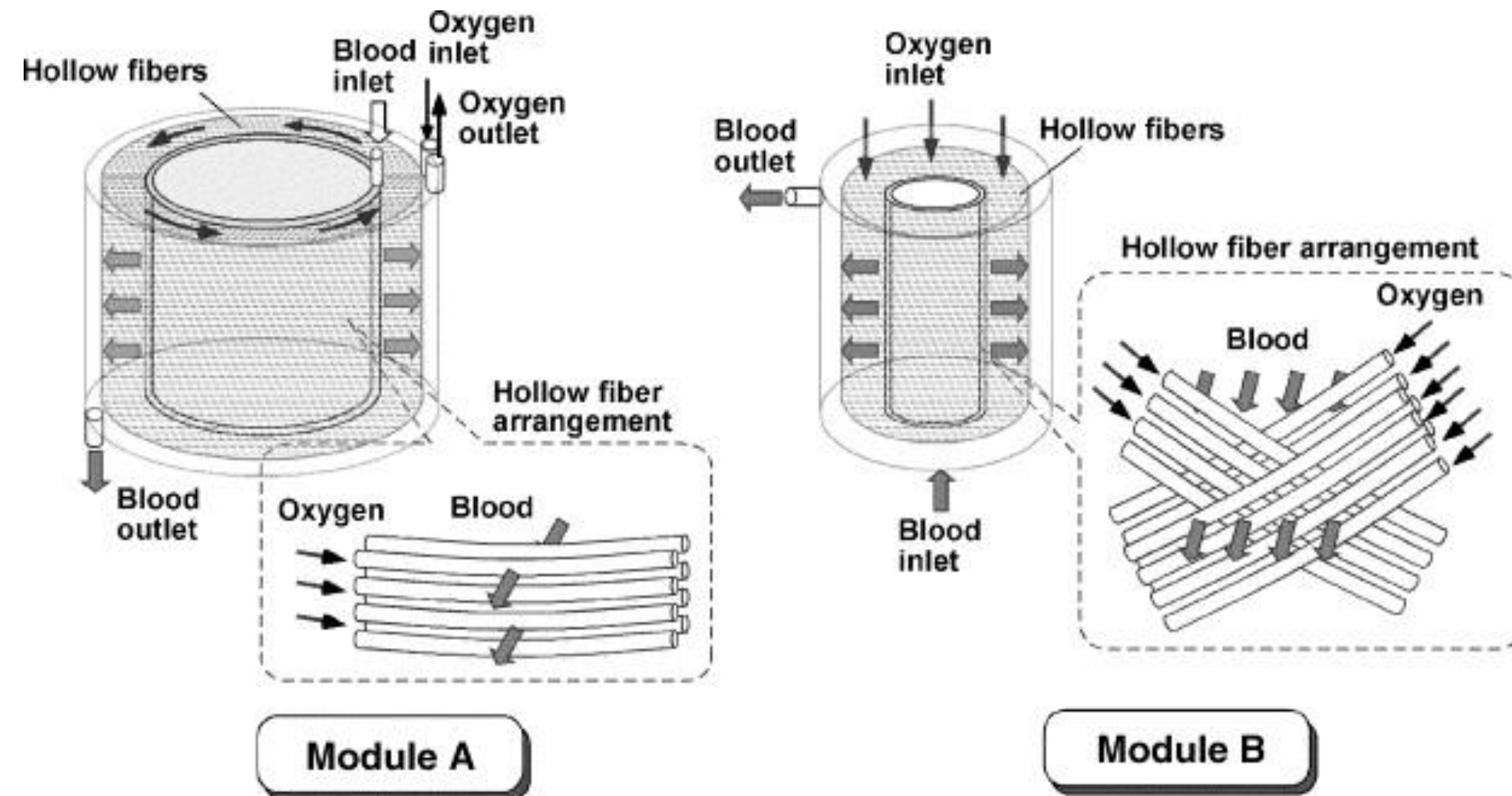
Membrane oxygenator



MAIN FUNCTION OF OXYGENATOR

Exchange oxygen and carbon dioxide in the blood during surgical procedures.

- The oxygenators removes carbon dioxide and adds oxygen to the blood that is pumped into the arterial system
- Oxygenators transfer less than 25 % that of normal lung .
- **Membrane function** :Gas exchange and heat exchange
- **Reservoir function** : Defoaming , filtration and store the blood





FORMULAS OF OXYGEN SUPPLY



O2 calculation:

A fully saturated gram of hemoglobin can carry 1.34 ml of oxygen

Oxygen carrying capacity:

$$\text{O}_2 \text{ capacity} = 1.34 \times \text{hgb} + 0.003 \times p\text{O}_2$$

Dissolved oxygen in plasma is formed by $p\text{O}_2 \times 0.003$

Arterial = 90-100 % Venous = 75-90 %

O2 content: $\text{content} = 1.34 \times \text{hb} \text{ arterial saturation} / \text{venous saturation} + 0.003 \times p\text{O}_2$



CAUSES OF INADEQUATE O₂ SUPPLY



- Oxygenator failure
- kink in course
- Obstruction in line
- Leak in gas line
- Inappropriate assembling gas filter
- Gas line mistakenly connected in gas outlet
- Gas outlet cap not removed
- prolonged bypass time cause oxygenator failure

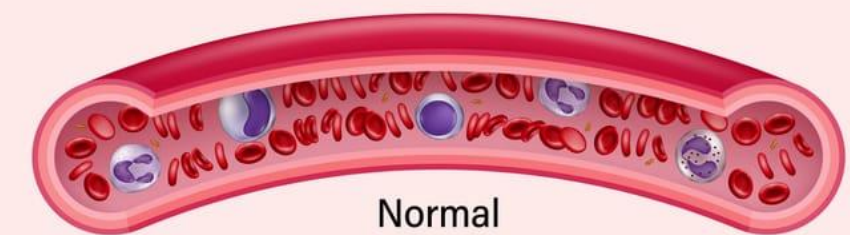
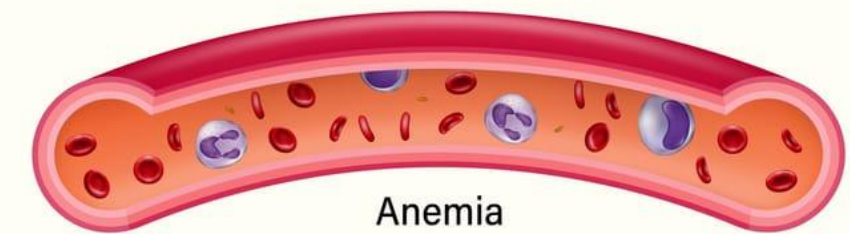




CAUSES OF ADEQUATE O₂ SUPPLY



- Plasma leak which cause inappropriate diffusion occurs.
- Water leak in oxygenator due to heat exchanger failure which increases hemodilution and hemolysis.
- Profound or deep hypothermia which increase affinity of oxygen.
- Improper blood to gas flow ratio.
- Patient with pre existing blood disorder like Anemia, cyanotic, sickle cell anemia.
- Hypoperfusion, Hypotension, shunting in capillaries
- Disconnecting of lines.
- Check for the O₂ analyser.

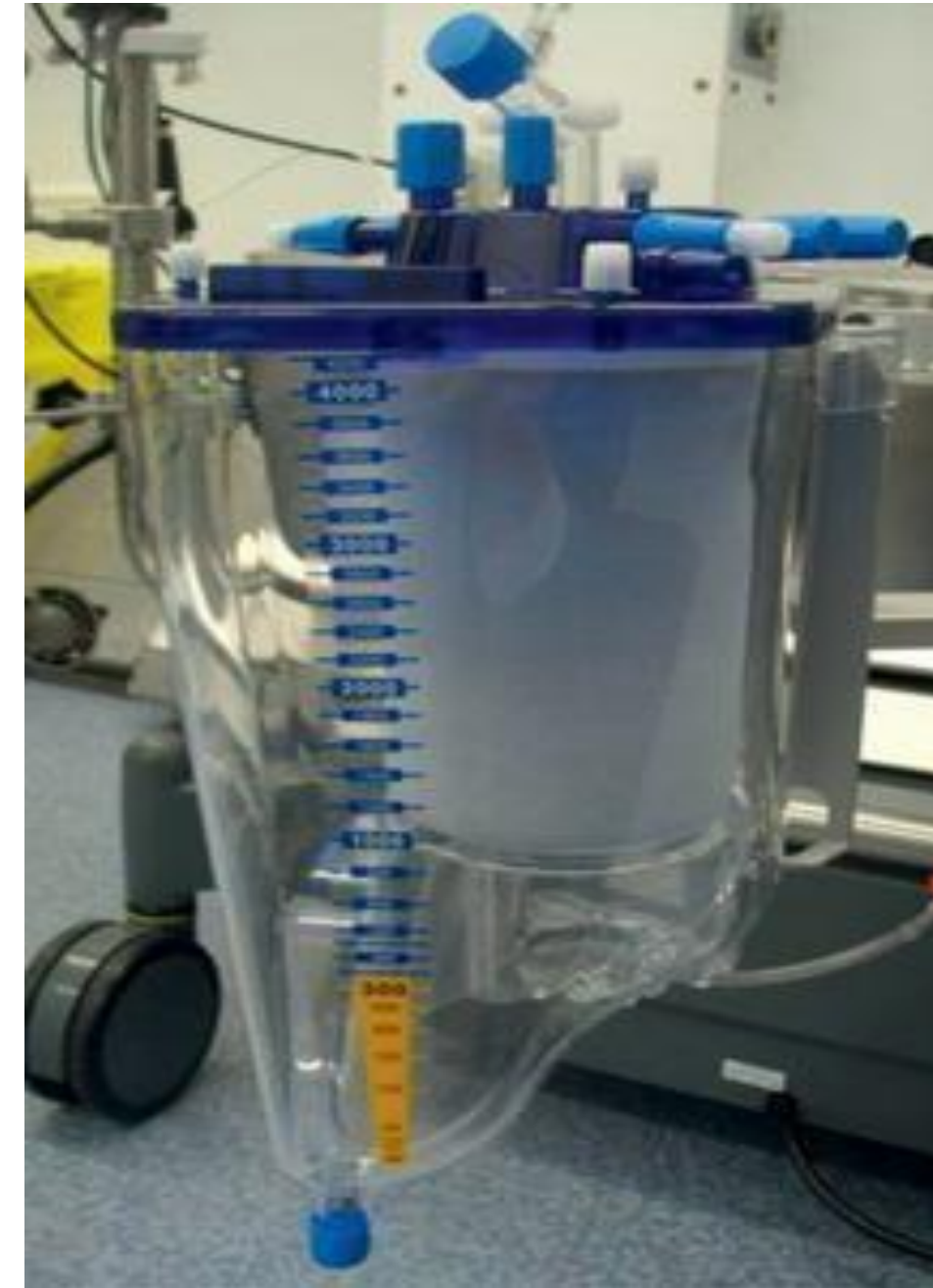




MANAGEMENT OF INADEQUATE OF O₂ SUPPLY



- Change out oxygenator
- Check the line properly
- Check gas line
- Ensure that oxygen lines are connected through the entire circuit.
- Check the O₂ analyzer to ensure the blender is delivering the proper Fio₂.
- Use largest oxygenator
- Correct gas sources





MANAGEMENT OF INADEQUATE OF O₂ SUPPLY



- kink free gas lines.
- Liquid free gas lines.
- Calibrate flow meter and blender regularly
- Use oxygen cylinder and bag valve mask and ambu bag for patient ventilation during bypass, till oxygenator changeout
- perform oxygenator change out drills
- open recirculation line if possible and increase flow.
- Pre-primed oxygenator technique
- Use 2 perfusionist.





CONCLUSION



- Perfusion accident occur suddenly and require a thoroughly planned to response to correct the situation.
- The unexpectedness of the problem may cause an improper response unless the perfusionist follows a systematic, deliberate procedure.
- The perfusionist should eliminate or alter any part of the circuit or procedure that might be a potential hazard.
- The perfusionist should always strive to correct problem before they occur.



REFERENCE



- The Manual Of Clinical Perfusion –D.Mark Brown
- Principles of Cardiopulmonary Bypass – Sunit Ghosh