

# ECMO, Hyperbilirubnemia & TPN

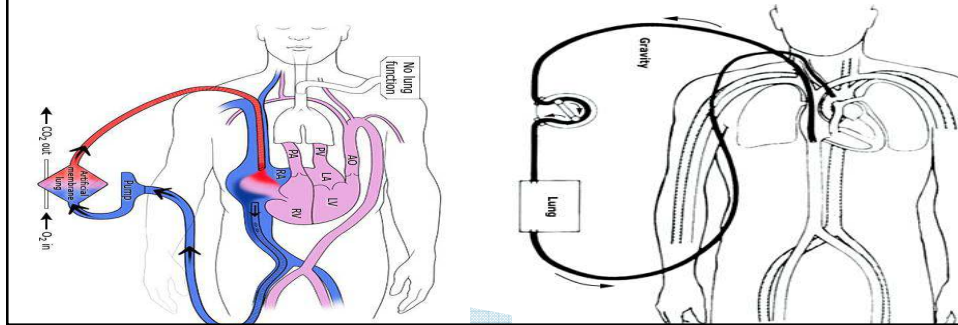
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## Objectives

- ▶ Briefly review Extracorporeal Membrane Oxygenation (ECMO)
- ▶ Review complications of concurrent TPN administration and ECMO support
- ▶ Review the mechanism behind ECMO and hyperbilirubinemia
- ▶ Review literature on hyperbilirubinemia secondary to ECMO treatment

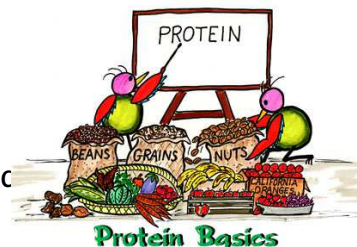
## What is ECMO?

- ▶ Prolonged cardiopulmonary support
- ▶ 2 types
  - Venoarterial (VA) and Venovenous (VV)
- ▶ VV provides respiratory support
- ▶ VA provides respiratory and hemodynamic



## ECMO & TPN

- ▶ Lipids
  - Can be given via ECMO machine but there is a risk of the emulsion adhering to and clogging the tubes
  - Recommended to be administered via PICC line
- ▶ Protein
  - 2 - 2.5 grams/kg/day
- ▶ Hyperbilirubinemia
  - RBC destruction
  - Unconjugated vs. conjugated
  - Cholestasis



# Hyperbilirubinemia

## ► What is Bilirubin?

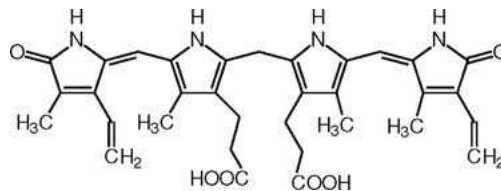
- The breakdown product of normal heme catabolism
  - Heme – part of the hemoglobin molecule in RBCs



# Hyperbilirubinemia

## ► RBC destruction during ECMO increases the risk of hyperbilirubinemia

- Increase heme
  - Increase in bilirubin
  - Cholestasis



## Thiagarajan et al

- ▶ “ECMO for CPR in Adults”
- ▶ Describe outcomes after the use of ECMO to support CPR (E-CPR) in adults using data from 1992 to 2007 from the Extracorporeal Life Support Organization (ESLO) registry
- ▶ Goals of the study were to describe demographic characteristics, evaluate techniques and report survival outcomes for adults supported with E-CPR
- ▶ Hyperbilirubinemia (total bilirubin > 15 mg/dL or direct bilirubin > 2 mg/dL) was reported as an ECMO complication and was significantly higher in non-survivors compared with survivors

## Abbasi et al

- ▶ “Natural Course of Cholestasis in Neonates on Extracorporeal Membrane Oxygenation (ECMO): 10-Year Experience at a Single Institution”
- ▶ Objectives - confirm the incidence of cholestasis and determine factors that contribute to its development and the natural course of cholestasis in neonates treated with ECMO
- ▶ Retrospective chart review of 211 patients receiving ECMO between 1995 and 2005 at Kosair Children’s Hospital
- ▶ 14% developed cholestasis
  - Directly related to duration of treatment (148 +/- 111 hours in no cholestasis group vs. 252.8 +/- 187 hours in cholestasis group)
  - Majority received VA ECMO but no difference in cholestasis related to type of ECMO support
  - Hyperbilirubinemia resolved prior to discharge with all but one
- ▶ Conclusion: longer duration of ECMO and other complication on ECMO (renal, infectious, and metabolic) are more likely in patients developing cholestasis

## Walsh-Sukys et al

- ▶ “The Natural History of Direct Hyperbilirubinemia Associated with Extracorporeal Membrane Oxygenation”
- ▶ Objective – determine the incidence and natural history of direct hyperbilirubinemia in neonates treated with ECMO
- ▶ 26 out of 67 patients (39%) developed direct hyperbilirubinemia
  - Duration and severity of hyperbilirubinemia were correlated
  - Resolved in all patients by 9 weeks post ECMO therapy
  - No structural abnormalities or infectious agents were identified as causes
  - Multiple linear regression analysis suggested the primary contributor was hemolysis during ECMO

## Conclusion

- ▶ Hyperbilirubinemia is a documented phenomenon associated with ECMO support
- ▶ Duration of ECMO support should be minimized as much as possible

# Questions



## References

- ▶ UpToDate. Extracorporeal membrane oxygenation (ECMO) in adults.
- ▶ Thiagarajan et. al. "ECMO for CPR in Adults." *Ann Thorac Surg.* 2009;87:778-85
- ▶ Walsh-Sukys, M.C, Cornell, D.J, and Stork, E.K. "The Natural History of Direct Hyperbilirubinemia Associated with Extracorporeal Membrane Oxygenation." *Am J Dis Child.* 1992; 146(10):11176-1180
- ▶ Abbasi, S, Stewart, D, Radmacher, P, and Adamkin, D. "Natural Course of Cholestasis in Neonates on Extracorporeal Membrane Oxygenation (ECMO): 10-Year Experience at a Single Institution." *American Society of Artificial Internal Organs.* July/August 2008; 54 (4):436-438.