

Surface modification of lung assist device by dual-modification with antithrombin-heparin (ATH) and tissue plasminogen activator (t-PA)

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Introduction

Pumpless neonatal lung assist device (LAD)

Goals: Treat neonates with respiratory failure

- Overcome the limitations of extracorporeal membrane oxygenation (ECMO) and mechanical ventilation
- Achieve long-term hemocompatibility

Antithrombin-heparin complex (ATH):

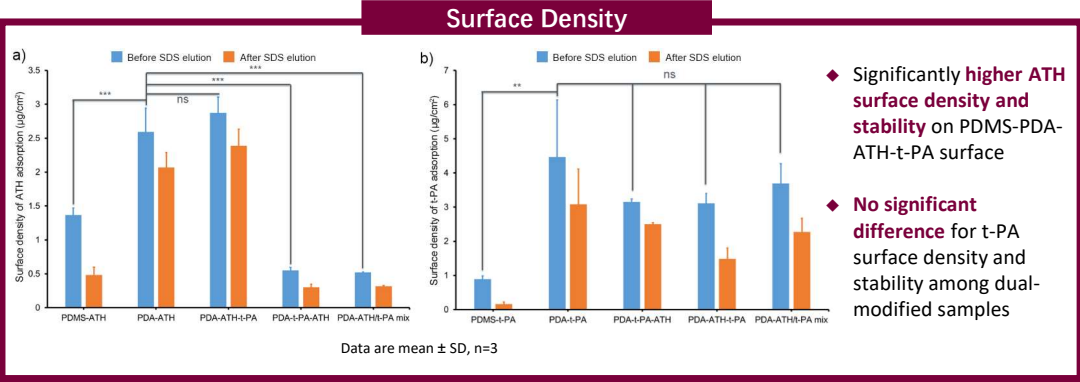
- Higher inhibition rates, ability to inhibit coagulation by both direct and catalytic mechanisms

Tissue Plasminogen Activator (t-PA):

- Rapidly lyse blood clots by converting plasminogen to plasmin

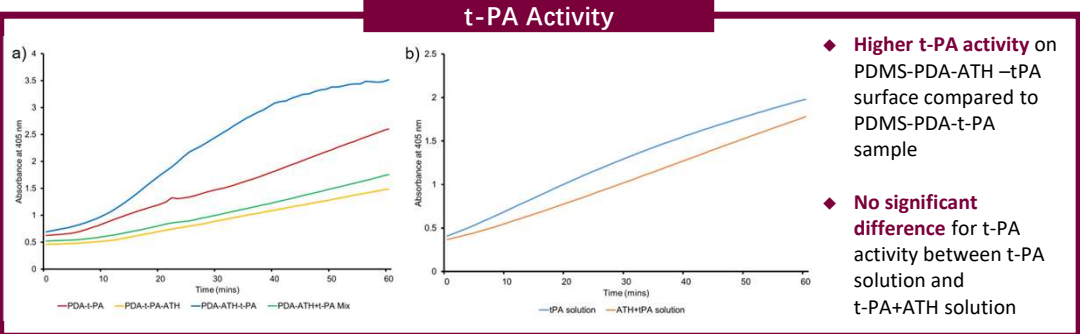
Aims:

- To achieve **long-term antithrombogenicity** in the polydimethylsiloxane (PDMS) oxygenator and other components of the lung assist device



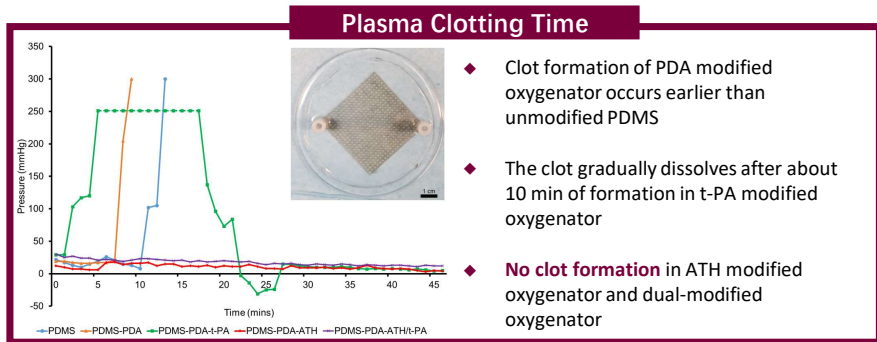
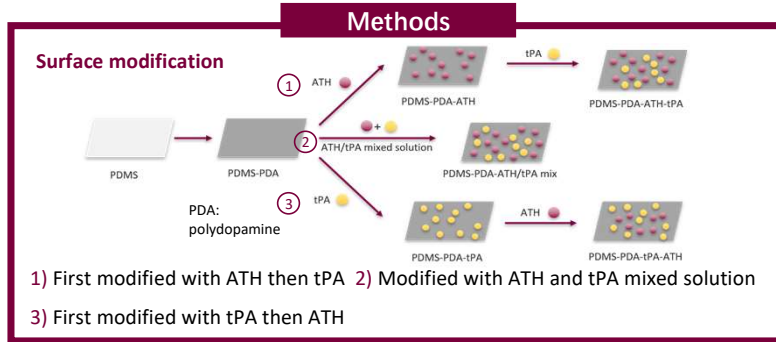
Conclusions

- The single oxygenator unit (SOU) modified with ATH first then tPA demonstrates the best combined effect for surface density of ATH and tPA and higher t-PA activity on surface.
- The SOUs modified with ATH and the dual-modification of ATH and tPA both have no clot formation within 45 mins.



Future Work

- Radiolabeling of ATH and tPA to determine homogeneity on various regions of oxygenator
- Chromogenic substrate assays to assess ATH in oxygenator
- Western blotting to determine protein adsorption from plasma
- Long-term hemocompatibility tests (4 days)
- Animal experiments: piglet model



References

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