







EXPLORING PH-INFLUENCED PROTEIN-MEMBRANE **INTERACTIONS IN HEMODIALYSIS USING SYNCHROTRON** MICRO-CT IMAGING

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INTRODUCTION

Hemodialysis membrane efficiency is critically influenced by protein adsorption, a process that varies with pH. Understanding these interactions is vital for improving hemodialysis outcomes. This study employs advanced imaging techniques to explore the pH-dependent behaviors of key human serum proteins-human serum albumin (HSA), fibrinogen (FB), and transferrin (TRF)-and their interactions with polyarylethersulfone (PAES) membranes.

METHODS

In-situ X-ray Synchrotron Radiation Micro-Computed Tomography (SR-µCT) at the Canadian Light Source (CLS) was utilized to visualize and analyze protein adsorption on PAES membranes across different pH conditions. This highresolution imaging technique allowed for detailed examination of protein deposition within the membrane structure, providing insights into how pH variations affect protein-membrane interactions.

RESULTS	CONCLUSION
SR- μ CT imaging revealed that protein adsorption was significantly higher at pH 6 compared to pH 7.2 for all three proteins studied. For HSA, the mean adsorption increased by 45% at pH 6 (p < 0.01), with the highest adsorption observed in the middle membrane layers (mean value of 1,100,000 μ^2 at layer index 90). FB adsorption at pH 6 was 1.3 times higher in the lower membrane regions compared to pH 7.2 (p < 0.05), with a peak value of 1,300,000 μ^2 at layer index 110. TRF showed the most significant increase in adsorption at acidic pH, with a 60% rise in the middle layers (p < 0.01) and a peak adsorption of 1,600,000 μ^2 at layer index 106.	This study provides a comprehensive analysis of how pH affects protein adsorption on hemodialysis membranes using advanced synchrotron-based imaging. The insights gained are crucial for developing strategies to enhance the biocompatibility and efficiency of hemodialysis membranes, ultimately improving patient outcomes.
	RESEARCH ETHICS: The principal investigator of the project, D Amira Abdelrasoul, has the Research Ethics Approval and th Operational Approval to conduct the research in Saskatchewa Health Authority, in Canada. She has the responsibility for th regulatory approvals that pertained to this project, and for ensuring that the authorized project was conducted according to the governing law.

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