

## Introduction

- **CDH** is a congenital defect in the diaphragm causing herniation of abdominal contents and impaired lung growth
- **PTFE** is a synthetic polymer that is the current standard of care for patch repair of CDH
  - Limitations: stiff, not biodegradable, no growth with the child leading to re-herniation and repeated intervention<sup>1</sup>
- **Polyurethane (PU)** is a novel material that is elastic, biodegradable, and biocompatible, allowing for optimized lung mechanics and tissue integration<sup>2</sup>

## Objective

We aimed to compare, through histological analysis, the effectiveness of PU vs PTFE in repairing CDH.

## Methods

- Sample of 18 rats:
  - 12 underwent a 4 mm diaphragmatic defect creation, followed by repair with PTFE (n=6) or PU (n=6)
  - 6 underwent sham laparotomy
- Euthanized at 4 weeks
- H&E staining performed on frozen 9  $\mu$ m thick sections

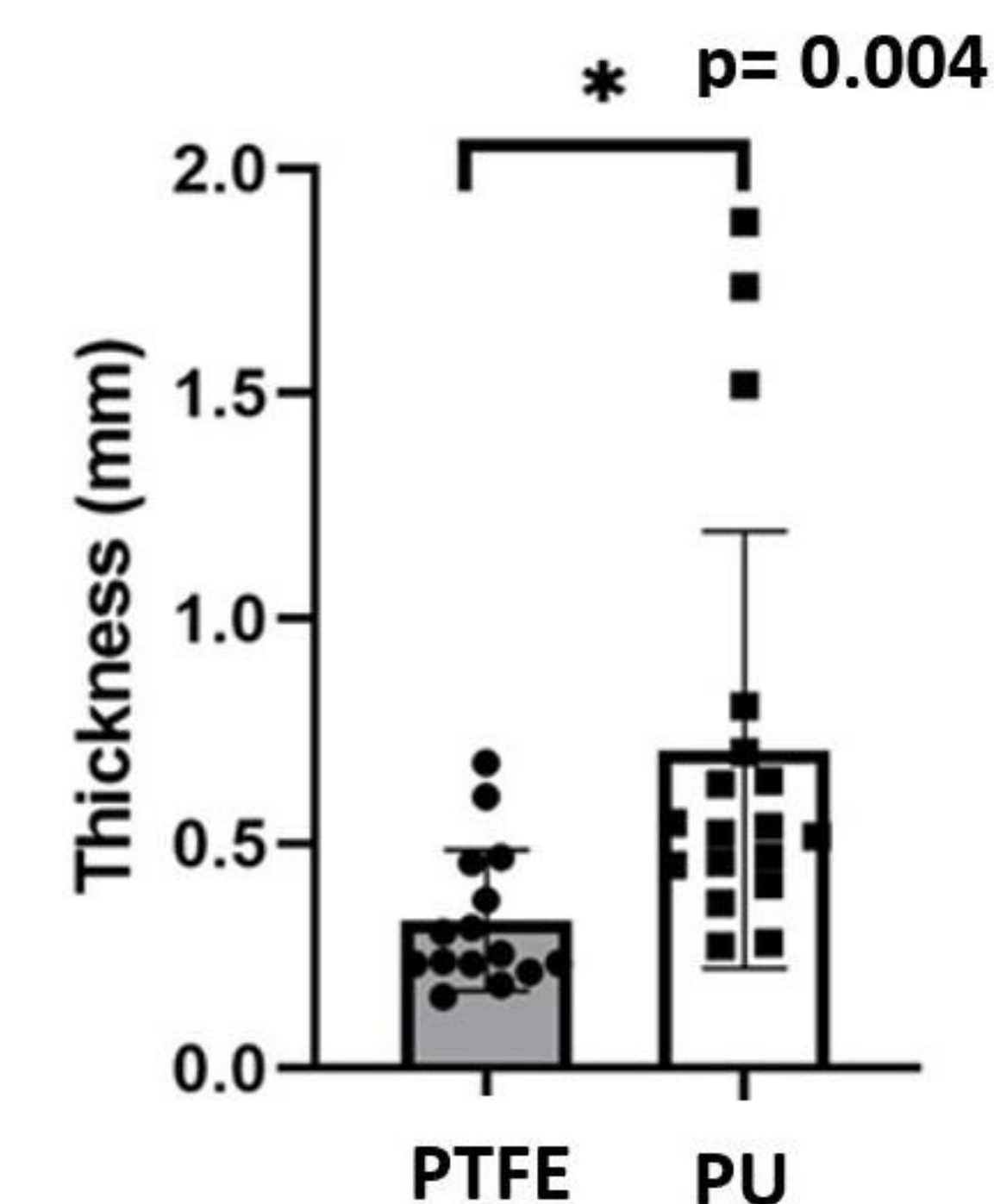
# Functional and Histologic Analysis of a Novel Elastic Biodegradable Patch for CDH Repair

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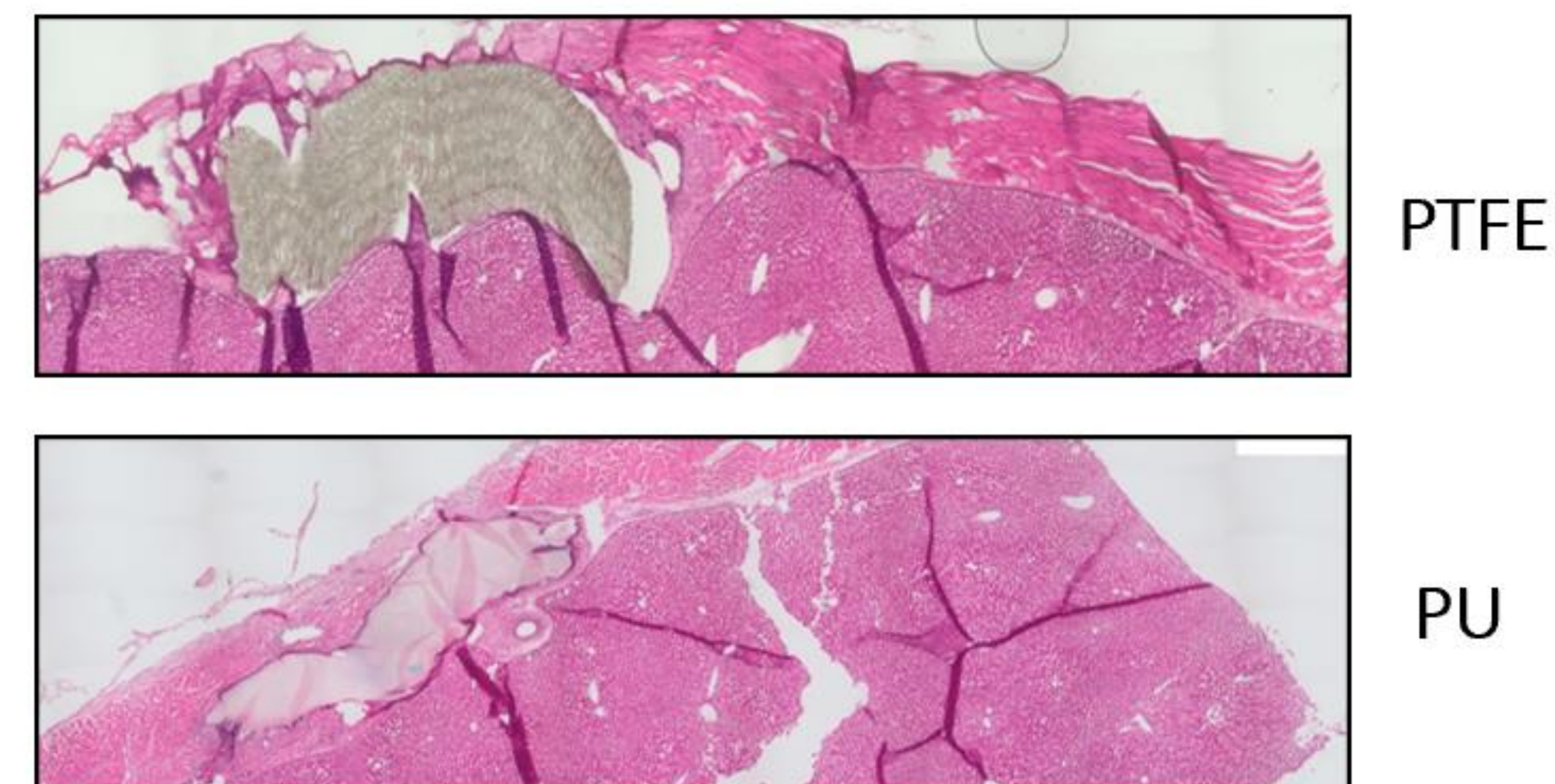
## Results

- No patch failures (recurrences) in either cohort
- PU had significantly thicker granulation tissue compared to PTFE (0.65 mm vs 0.36 mm,  $p=0.004$ )

**Figure 1:** Thickness of inflammatory capsule on the thoracic side of the patch in PTFE and PU



**Figure 2:** Results of H&E in PTFE and PU



## Conclusion

Although PU caused more inflammatory capsule formation on the thoracic side compared to PTFE, there were no patch failures, demonstrating its potential as an alternative to PTFE.

## Future Directions

- Experiments with larger sample size and longer follow up time
- Larger defect creation and repair
- Additional histological analysis to examine patch integration with native tissue
- Functional outcome studies

## References

1. Zhao W, Ju YM, Christ G, Atala A, Yoo JJ, Lee SJ. Diaphragmatic muscle reconstruction with an aligned electrospun poly( $\epsilon$ -caprolactone)/collagen hybrid scaffold. *Biomaterials*. 2013 Nov;34(33):8235-40. doi: 10.1016/j.biomaterials.2013.07.057. Epub 2013 Aug 6. PMID: 23932497.
2. Guelcher SA. Biodegradable polyurethanes: synthesis and applications in regenerative medicine. *Tissue Eng Part B Rev*. 2008 Mar;14(1):3-17. doi: 10.1089/teb.2007.0133. PMID: 18454631.