ABSTRACT SUBMISSION

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Biomatériaux innovants dans la prise en charge de la hernie diaphragmatique congénitale à large défect

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ABSTRACT

Congenital diaphragmatic hernia is a severeand rare neonatal malformation with poor diagnosis in case of large defect hernia [1]. Despite advances in the management of resuscitation and surgery, the recurrence rate can still reach up to 50% of children if needed a prosthetic patch to close the defect. Specific diaphragmatic prosthesis, which have to separate the thoracic and abdominal cavities, should ideally have different surface conditions on either side of the barrier membrane. Analysis of an explant showed penetration of cellular elements into the porous structure of the DualMesh*, reference material in this indication, corresponding to a polytetrafluoroethylene (e-PTFE) membrane with two different faces. Microscopic observations of the tissue response show a very heterogeneous host response according to the area of interest, with a strong colonization in the center of the prosthesis and, on the contrary, few cells and a rare connective tissue at the periphery of the prosthesis especially in the leakage area [2]. The lack of elasticity of e-PTFE is strongly implicated in hernia recurrence. Surgeons are therefore waiting for a biomaterial better adapted to the repair of the diaphragm. To meet this clinical challenge, we have initiated two ways to improve the implant device:

1. The chemical functionalization of e-PTFE by polydopamine [3], which serves as an anchoring layer for a platelet-enriched fibrin membrane, also called PRF for "Platelet Rich Fibrin". The objective of this biological coating is to promote the tissue integration of the biomaterial and, consequently, to reduce the risk of laekage. Microscopic evaluations allows to characterize, interactions between PTFE, polydopamine and PRF.

2. The development of a new biomaterial based on an electrospun polymer meeting the specifications of the diaphragmatic prosthesis. The mechanical tests of this new implant material clearly reveal mechanical properties better adapted to clinical and biological constraints than those of the current reference material (e-PTFE). Investigations carried out in cell culture, electron microscopy and atomic force microscopy make it possible to compare the biological responses to the two faces of this prototype, in its native or functionalized condition, with respect to the reference biomaterial.

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