The peritoneum is the serous membrane that lines the abdominal cavity and minimizes friction between internal organs. In addition, when exposed to a special solution, the peritoneum can act as a filter that removes waste products from the body. This property is exploited by peritoneal dialysis (PD), a renal replacement method for patients with renal failure. PD is gaining increasing attention as the number of patients requiring renal replacement therapy increases, placing a significant burden on healthcare. In addition, PD is a good method for home therapy. The key to success in PD is preserving the integrity of the peritoneal membrane to serve as a dialysis organ. However, for reasons still not fully understood, the peritoneal membrane in some patients may be affected by fibrosis, which means that it becomes thickened and unable to remove toxins efficiently.

The peritoneum is covered with a thin layer of mesothelial cells, underneath in the interstitium, there are fibroblasts, together they protect the peritoneal membrane and affect the preservation of its structure. They perform this function by producing diverse types of regulatory molecules in response to changes in the micro-environment of the peritoneum. Some of them are sensed by the primary cilium on the surface of the cells.

The primary cilium is a kind of antenna through which it receives signals from the external environment and conducts them inside the cells, causing appropriate modifications in the functioning of the cells. There are many receptors associated with the primary cilium. When bound to the appropriate ligand, they can conduct signals through specific pathways. These include morphogens, which are proteins that play a key role in tissue development, but also in fibrosis.

During peritoneal dialysis there appear myofibroblasts, cells that produce substantial amounts of extracellular matrix components that accumulate in tissues during fibrosis. Interestingly, these cells can arise under the influence of numerous factors, both from the mesothelium and from fibroblasts. It is not clear whether morphogens and the signals they transmit through the primary cilia affect the development of myofibroblasts and what is their further effect on peritoneal fibrosis.

Long-term dialysis is associated with inflammation in the peritoneum, which is associated with the production of many pro-inflammatory factors. Therefore, in the proposed project, we will investigate how the inflammatory environment during peritoneal dialysis affects cell signalling through primary cilia in mesothelial cells and fibroblasts, and we will identify which of these signalling pathways contribute to peritoneal fibrosis. Understanding the process that promotes structural and functional changes in the peritoneum will then enable the development of new therapeutic strategies and prolong the use of this renal replacement therapy.