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Study of a Cross-Flow Membrane to a Kidney Encapsulation Engineering Structures for Immunosuppression Filter

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Abstract : The kidneys perform an important role in the human hormones that regulate the blood pressure, produce an active form of vitamin D and control the production of red blood cells. Kidney disease can cause health problems, such as heart disease. Also, increase the chance of having a stroke or heart attack. There are mainly to types of treatments for kidney disease, dialysis, and kidney transplant. For a better quality of life, the kidney transplant is desirable. However, kidney transplant can cause antibody reaction and patients' body would be attacked by immune system of their own. For solving that issue, patients with transplanted kidney always take immunosuppressive drugs which can hurt kidney as side effects. Patients willing to do a kidney transplant have a waiting time of 3.6 years in average searching to find an appropriate kidney, considering there are almost 96,380 patients waiting for kidney transplant. There is a promising method to solve these issues: bioartificial kidney. Our membrane is specially designed with unique perforations capable to filter the blood cells separating the white blood cells from red blood cells. White blood cells will not pass through the encapsulated kidney preventing the immune system to attack the new organ and eliminating the need of a matching donor. It is possible to construct life-time long encapsulation without needing pumps or a power supply on the cell's separation method preventing futures surgeries due the Cross-Channel Flow inside the device. This technology allows the possibility to use an animal kidney, prevent cancer cells to spread through the body, arm and leg transplants in the future. This project aims to improve the quality of life of patients with kidney disease.

Keywords : kidney encapsulation, immunosuppression filter, leukocyte filter, leukocyte
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