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Kidney on Chip- Breaking the Barrier in Medical Technology.

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Human physiology and bodily functions are extremely complex and vital for life. The organs such as the heart, lungs, liver, kidney, and brain in the body are essential. Every organ has its cell type and performs specific functions required by the body. Out of these, kidney plays a crucial role by performing several functions like maintaining homeostasis, blood filtration, electrolyte balance, red blood cell production, maintaining pH, blood pressure regulation, and osmolality regulation. In the process of serving the need of the body, kidney faces numerous challenges due to the unhealthy diet and personal habits of a person. At this stage, renal replacement therapy such as dialysis or kidney transplant is needed. Dialysis is a painful, and costly affair providing only nominal kidney functions such as ultrafiltration but fails to provide tubular reabsorption, secretion, and excretion functions. It is estimated that dialysis provides only 20-25% of required kidney functions. On the other hand, kidney transplantation with the present surgical advancement can provide full patient satisfaction. But the availability of donor kidneys, immune rejection, and biological and blood group match is always agonizing problems. Due to the above-stated difficulties, it is highly important to develop a research solution that can address all the complications at a low cost. The regeneration of possible kidney functionalities along with blood filtration can be achieved using Kidney on-Chip technology. This report will present certain crucial designs, studies, and analysis related to mimicking of human kidney reabsorption function utilizing the capabilities of MEMS and Microfluidics technologies. The present work can pave one step forward towards the Kidney-on Chip technology. Especially, in this present work, the reabsorption function is aimed to regenerate. The simulation and mathematical models to predict reabsorption rate have not been studied. The simulation models have significant impact in optimizing the device performance and speeding up the device production. In the case of successful implementation of ultra-filter and bioreactor, the KOC will revolutionize the organ mimicking and the organ transplantation as well.

Biography

Koushik Guha received his B.Tech. Degree in Electronics & Communication Engineering in 2005 India and his M.Tech. Degree in Electronics & Communication Engineering (RF & Microwaves) in 2007 India followed by PhD from NIT Silchar in 2016 on "Design and Modeling of RF MEMS Shunt Switch". Currently he is Assistant Professor in Electronics & Communication Engineering Dept. at National Institute of Technology, His profound interest towards MEMS designing has made him as the one of the leading researchers not only in NIT Silchar but in the country with research articles in highly reputed Journals. He has published more than 100 papers in journals like IEEE, Springer, Elsevier etc. and conferences of international repute. He has authored around 10 book chapters and one book on “Noise in RF MEMS Switch: Modeling and Simulation”.