Preface

Cell culture is an in vitro laboratory technique widely used for growing plant and animal cells. It is primarily utilized to learn and evaluate cellular processes under artificial but defined experimental conditions. Isolated cells and cell lines are enabled to grow ex vivo in glass or plastic appliances using artificial nutrients and supplements for targeted explorations. The composition of liquid medium is adjusted to meet the requirement of different types of cells to be cultured. Till now culturing cells in a flat-bottomed flask or Petri dish where cells are allowed to expand on a flat surface, i.e., in two dimensions has been a common practice. The technique for its ease is now widely adopted in clinics for diagnostic purposes. Use of cell culture techniques has not remained limited to unraveling the mysteries of cell biology but also extended to other areas like qualitative and quantitative assessment of metabolic activities.

The possibility of growing healthy and viable cells ex vivo led to the human urge towards a new direction for achieving longevity by replacing the ailing or diseased body tissues with renewed-healthy cells and tissues. Organ transplantation has been viewed as the most preferred choice in the state of kidney and heart failures. Tumorous tissues also leave no choice but to be removed and if possible replace the organ with the normal healthier ones. Replacement with healthy normal tissues could be a better choice for cancerous tissue before metastasis. Even after the onset of metastasis a swapping with healthy tissue might provide a control as the source of malignant signaling would not be there. Though, identifying an accurate match and a willing donor has always been scarce. This led to an expedition for generating ex vivo implants by growing patients' own cells. Such artificially created functional tissue is expected to replace the diseased tissue/organ without any fear of rejection. The quest

was stumbled upon by the fact that artificially grown cells by conventional means are functionally unviable. Mostly they grow and remain as monolayer, hardly rearranging and adapting a cohesive tissue like features. It is realized that the conventional culture methods produce the cells that may morphologically look alike their counterpart present in vivo but almost always are functionally compromised. In order to produce physiologically viable cells, replicating in vivo like physical environment by providing three dimensional (3D) spaces for the cells to grow is attempted. This could help in improving the functional performance of the cells while still necessitating conventional supplements. Though, culturing cells in 3D space created through inert conventional polymers could produce relatively better results than those achieved by growing them in 2D culture wares yet they can barely yield physiologically viable tissue. It is speculated therefore that a 3D scaffold created using a biochemical mimic of in vivo like tissue specific extracellular matrix (ECM) would lead to far more gratifying outcomes. Thus, for generating functional cells applicable for tissue engineering and regenerative medicine purposes we need devices that mimic ECM both physically and biochemically. Not only that, we also have to improve our understanding about cell-ECM dynamics and interdependency of different cells. Cells need to be co-cultured for achieving desired co-operative and co-ordinated physiological outcome. Till now cells have generally been evaluated in isolation without considering the fact that they would behave differently if other cells are present in their surroundings, which is the case in native tissue environment.

We are at the onset of a leap by switching over from 2D to 3D cell-culture practices. Though there are limited devices available at present for culturing cells in the desired ECM mimicking environment provided in 3D, we still hope for better accessibility to such 3D culture wares in the near future. With the enormous efforts all over the world towards culturing cells in a tissue mimicking environment we keenly anticipate vital improvements in our understanding of cell-biology, diagnosis and tissue engineering. Better physiological control over artificially grown cells will certainly have its impact on the efficiency and acceptability of regenerative medicine.