

3D extracellular morphology features from rapid photo-polymerized cell replica

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ABSTRACT

Morphology features of cells plays a vital role in cell research, drug delivery, diagnostic, therapeutic and many other applications. In this paper we report a method of morphology feature extraction from the cell replica. Cell imprinting is a soft lithography technique used to obtain the replica of cell morphology. Morphology features like shape and size of cell, shape and size of nucleus, pores in cell membrane can be imaged comparatively with minimal noise or without any noise and the same can be detected using this technique. This technique helps to investigate the shape of grooves, pores, blebs or microvillus on the cellular surface and helps in better diagnosis and analysis at single cell level. However conventional fixation, sectioning and viewing under scanning electron microscope (SEM) or transmission electron microscope (TEM) can provide many insights more clearly although the process is quite complex and tedious. The main finding of this research is that we developed an imaging technique for the cells, which can provide morphology information on single cell sub organelle scale in much detail. Atomic force microscope (AFM) in tapping mode was used to image the replica. Technique also delivers a 3-D image of the cell along with its complete morphological details. The limitation of this technique is that, it only provides the morphology information. Thus abnormalities which doesn't designate on morphology cannot be diagnosed. This technique finds its application where single cells are to be analyzed and diagnosis for study based on morphology, especially for drug delivery applications and for investigations based on molecular pathways. As a future prospective, morphology features obtained through this technique can also be used to train the artificial neural network for decision making completely based on this technique.

KEYWORDS:

Single Cell; Soft Lithography; Imprint; Cell Replica; CIL, Morphology; Cancer; Image Processing; AFM; UV; Feature Detection.