The design of a thermoresponsive surface for the continuous culture of human pluripotent stem cells

ABSTRACT

Commonly, stem cell culture is based on batch-type culture, which is laborious and expensive. We continuously cultured human pluripotent stem cells (hPSCs) on thermoresponsive dish surfaces, where hPSCs were partially detached on the same thermoresponsive dish by decreasing the temperature of the thermoresponsive dish to be below the lower critical solution temperature for only 30 min. Then, the remaining cells were continuously cultured in fresh culture medium, and the detached stem cells were harvested in the exchanged culture medium. hPSCs were continuously cultured for ten cycles on the thermoresponsive dish surface, which was prepared by coating the surface with poly(N-isopropylacrylamide-co-styrene) and oligovitronectin-grafted poly(acrylic acid-co-styrene) or recombinant vitronectin for hPSC binding sites to maintain hPSC pluripotency. After ten cycles of continuous culture on the thermoresponsive dish surface, the detached cells expressed pluripotency proteins and had the ability to differentiate into cells derived from the three germ layers in vitro and in vivo. Furthermore, the detached cells differentiated into specific cell lineages, such as cardiomyocytes, with high efficiency.

.

Keyword: Biomaterial; Cardiomyocyte; Human embryonic stem cell; Thermoresponsive surface; Xeno-free culture