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Abstract

Translating human Adipose-derived Stem Cells (hASCs) to Clinical Practice requires standardization of isolation and culture protocols

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Adipose-derived stromal/stem cells (ASCs) have been explored in recent pre-clinical trials to treat diseases in a broad range of tissues. The ultimate goal is to translate these findings to clinical trials to test safety and efficacy in human subjects. However, multiple steps are needed to make ASC clinically available: adipose tissue must be stable for up to 24 hrs during transit to cGMP laboratories[1] for further processing. Second, isolation and expansion protocols must eliminate exposure to animal proteins[2]. This will require the development of animal-free products suitable for the culturing of the cells. Current protocols[3,4] employ several animal-derived reagents, such as collagenase for the enzymatic digestion of adipose tissue, FBS for cell culture and expansion, trypsin derived from porcine tissue (stomach) for cell detaching and passaging, etc. Likewise, the length of time between adipose tissue harvest and processing will need to be systematically evaluated with respect to cell yield, viability, and function.

The current study explores these technical challenges exploring alternative, non-animal sources of collagenase and trypsin-like enzymes for the isolation and passage of ASCs and assessing the effect of time delays on the yield and function of ASCs after collagenase digestion. The results obtained demonstrated that it's possible to use purified or animal-free enzymes for digestion of adipose tissue without decreasing the

yield of stromal/stem cells nor affecting their surface markers[5] and differentiation potential. Cell yield and viability prove to be similar amongst any of the products (for both SVF and ASCs). The differentiation potential was not affected and ASCs were easily induced to adipogenic, osteogenic and chondrogenic lineages. Cell surface markers analysis showed no significant differences amongst any of the different grades of collagenase and trypsin-like products.

These outcomes have practical implications with respect to the development of Standard Operating Procedures for cGMP manufacture of clinical grade human ASCs, which are essential for allowing their future use in the clinical practice.

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