AGE REPROGRAMMING AND EPIGENETIC REJUVENATION

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Introduction: Age reprogramming represents a novel method for generating patient-specific tissues for transplantation. It bypasses the de-differentiation/re-differentiation cycle that is characteristic of the induced pluripotent stem (iPS) and nuclear transfer-embryonic stem (NT-ES) cell technologies that drive current interest in regenerative medicine. Despite the obvious potential of iPS and NT-ES cell-based therapies, there are several problems that must be overcome before these therapies are safe and routine.

Methods: As an alternative, age reprogramming aims to rejuvenate the specialized functions of an old cell without de-differentiation; age reprogramming does not require developmental reprogramming through an embryonic stage, unlike the iPS and NT-ES cell-based therapies. Tests of age reprogramming have largely focused on one aspect, the epigenome.

Results: We have shown that epigenetic rejuvenation can be achieved in vitro in the absence of de-differentiation using iPS cell reprogramming factors. Recent Studies on the dynamics of epigenetic age (eAge) reprogramming have demonstrated that the separation of eAge from developmental reprogramming can be explained largely by their different kinetics. Age reprogramming has also been achieved in vivo and shown to increase lifespan in a premature ageing mouse model.

Conclusion: We conclude that age and developmental reprogramming can be disentangled and regulated independently in vitro and in vivo. The stage is now set to develop technologies that will rejuvenate cells without the need to go through an embryonic stage – that is to simply make old cells young.