

Young microenvironment promotes synovium-derived stem cell chondrogenesis

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Current operative treatment for autologous chondrocyte implantation is limited due to a shortage of large quantity and high quality autologous chondrocytes or stem cells possessing chondrogenic potential. Cell senescence also presents a major challenge during ex vivo cell expansion for cartilage regeneration. Synovium-derived stem cells (SDSCs) have been established as tissue-specific stem cells for chondrogenesis. Our recent study suggests that decellularized stem cell matrix (DSCM) deposited by SDSCs could enhance SDSC proliferation and chondrogenic potentials. In this study, we hypothesized that DSCM from a fetal source could rejuvenate aged human SDSCs toward proliferation and chondrogenesis. Our study, for the first time, demonstrated that DSCM deposited by fetal SDSCs can provide a rejuvenating effect and a tissue-specific stem cell microenvironment to enhance adult SDSC expansion and chondrogenic potential. Our elasticity data showed that SDSCs seeded on plastic flasks exhibited the highest elasticity compared to SDSCs expanded on DSCMs, which is consistent with plastic flasks having infinite elasticity while DSCM from adult SDSCs has higher elasticity than DSCM from fetal SDSCs. Our microarray data suggested that miR145 was downregulated in DSCM expanded SDSCs but upregulated during chondrogenic differentiation, especially for SDSCs expanded on fetal source DSCM. DSCM from fetal SDSCs demonstrated a “fountain of youth” effect for adult SDSCs possibly through providing specific microenvironmental cues, which will benefit cell-based cartilage engineering and regeneration. This study provides a novel and promising approach for the treatment of cartilage defects, particularly in aged patients.

Biography

Dr. Ming Pei completed his Ph.D. from Beijing University and conducted postdoctoral studies at Harvard-MIT Division of Health Sciences and Technology (HST). Currently he is an Associate Professor and the Director of Stem Cell and Tissue Engineering Laboratory at the Department of Orthopedics at West Virginia University. He also serves as Adjunct Faculty in Exercise Physiology and Mechanical and Aerospace Engineering at WVU. He has published more than 45 papers in reputed journals and is serving as an Editorial Board Member for seven journals.

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