

Extracellular vesicles as multispecific therapeutics for longevity medicine

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Ageing is a systemic, multifactorial process driven by interconnected molecular and cellular pathways rather than isolated defects, highlighting the need for therapeutic strategies capable of coordinated, multi-target intervention. Extracellular vesicles (EVs) have emerged as potent mediators of intercellular communication and are increasingly recognised as promising candidates for longevity medicine due to their intrinsic multi-specificity. In this presentation, we examine the evidence positioning EVs—particularly young plasma-derived small EVs (sEVs)—as next-generation longevity therapeutics. Drawing on recent landmark preclinical studies, we discuss how young sEVs restore mitochondrial energy metabolism, reduce cellular senescence, enhance stem cell function, and improve physiological performance across multiple organs, including brain, muscle, heart, bone, and reproductive tissues. Notably, systemic administration of young sEVs extends median lifespan and reduces frailty in aged mice, outperforming several established longevity interventions. Mechanistically, these effects are linked to age-dependent differences in EV cargo, especially miRNAs converging on the PGC-1 α –mitochondrial axis. We also critically assess current limitations, including incomplete coverage of the hallmarks of ageing, unanswered questions regarding durability after treatment cessation, and challenges related to manufacturing, standardisation, and regulatory translation. Collectively, this work supports EVs as a distinct class of multispecific biological therapeutics with the potential to reshape longevity medicine, while outlining key gaps that must be addressed to enable safe and effective clinical translation.

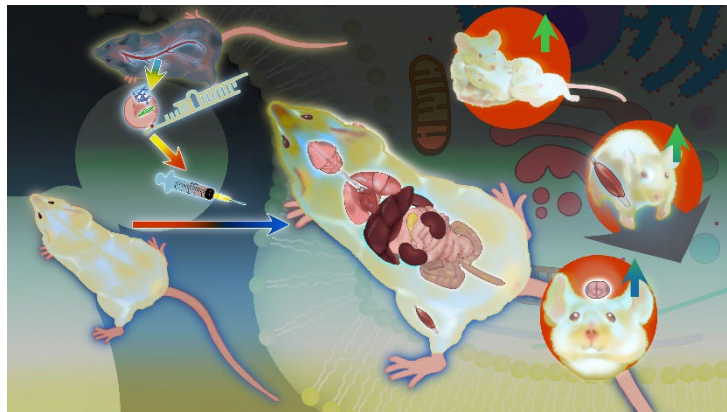


Figure 1. Conceptual framework illustrating extracellular vesicles (EVs) as multispecific mediators of systemic rejuvenation and longevity medicine.

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