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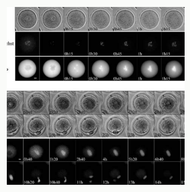
Vesicle formation during reticulocyte maturation



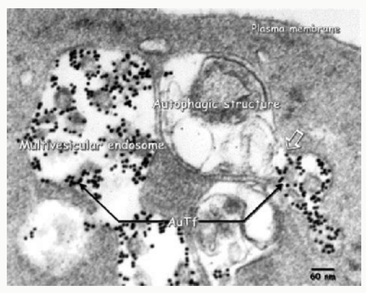
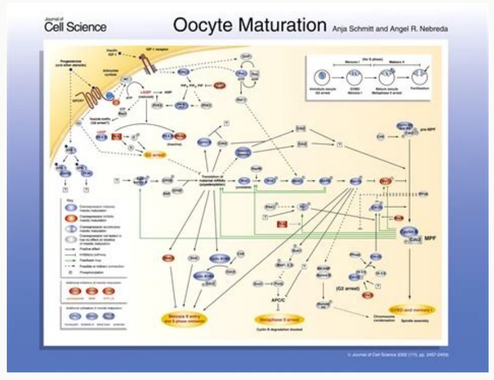
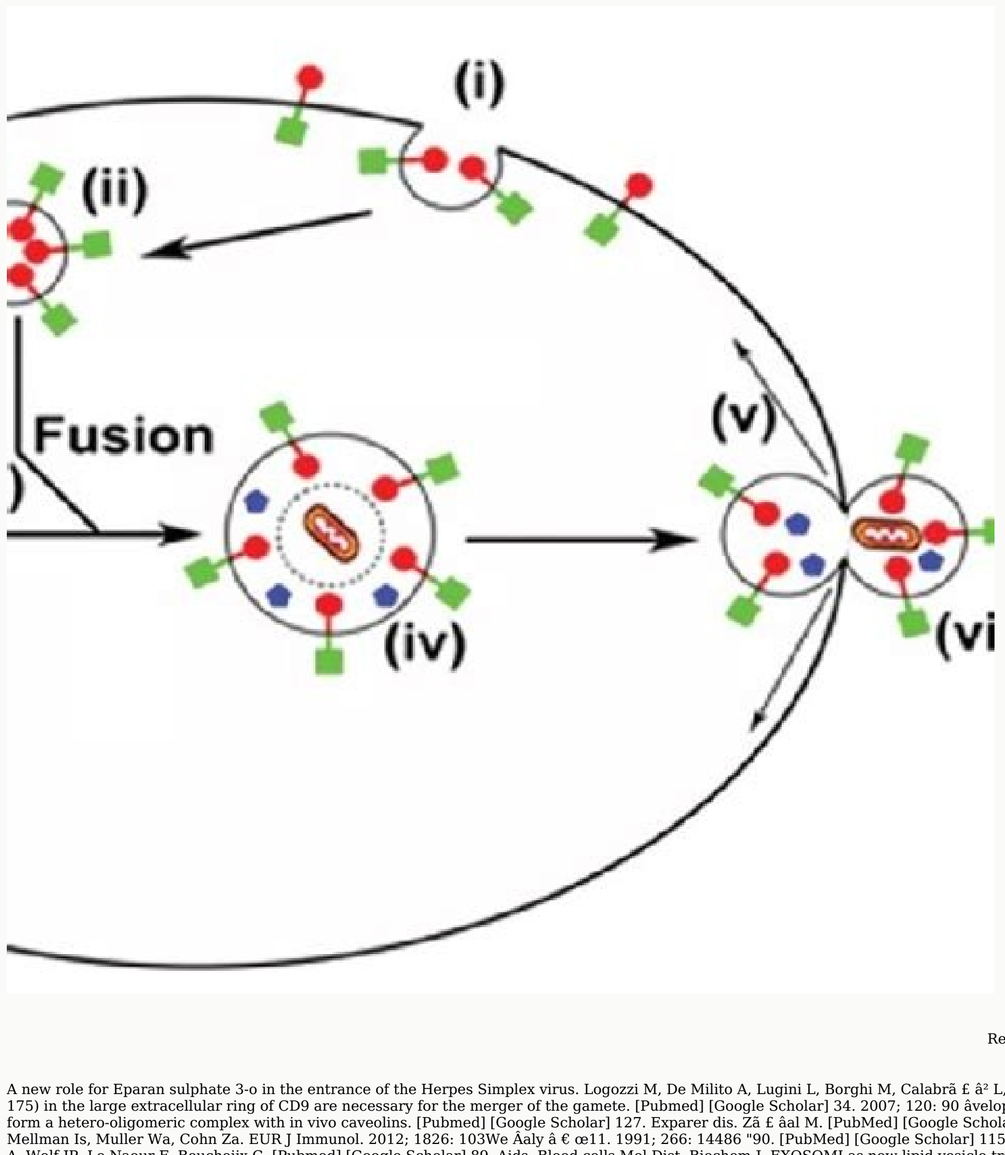


表 1　干细胞来源外泌体修复多种疾病损伤的重要文献

疾病模型	实验结果	潜在机制	参考文献
心血管系统疾病	MSC-Exo 用于大鼠心肌梗死模型，大鼠的心脏纤维化、炎症反应得到有效抑制，心脏功能明显改善，而且发现这种效果明显优于 MSC。	二者相似的 miRNA 表达谱可能是 MSC-Exo 可以替代 MSC 用于心脏修复的原因之一。更为重要的是，来自 MSC-Exo 中的几种 miRNA 的表达显著不同于 MSC，如 MSC-Exo 中 miR-15、miR-21 的表达水平与 MSC 相比显著更低，这可能是 MSC-Exo 修复效果好于 MSC 的原因。	[11]
外伤性脑损伤和神经系统疾病	给予 MSC-Exo 后，外伤性脑损伤大鼠模型病变边界区和伤状回中新生的内皮细胞数目、伤状回中新形成的神经元数目显著增加，炎症反应明显减少，感觉及认知功能也有了显著改善。	MSC-Exo 通过减少外伤性脑损伤后大鼠的炎症反应及促进血管生成和神经发生从而有效改善神经功能，但研究未对 MSC-Exo 的促功能恢复机制进行详细阐述。	[14]
肌肉骨骼系统疾病	MSC-Exo 减少了纤维化、增强了血管生成，加速了肌肉的再生。	MSC-Exo 中有许多与修复相关的 miRNA，如发现了 miR-494 可以增强血管和肌细胞的生成。	[18]
肝损伤	hiPSC-MSC-Exo 可以有效减轻由于缺血再灌注导致的肝脏损伤。	可能是通过抑制炎症反应、细胞凋亡和减弱氧化应激来保护肝脏。	[24]
肾损伤	hucMSC-Exo 被发现可以用来修复改善肾脏损伤，	hucMSC-Exo 可以促进肾上皮细胞增殖，从而有效减轻因顺铂诱导的肾脏氧化应激和凋亡损伤。	[31]

表注：MSC-Exos：间充质干细胞衍生的外泌体；MSC：间充质干细胞。





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