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1 Name of journal: World Journal of Stem Cells

2 ESPS Manuscript NO: 19735

3 Columns: Review

5 Stem cell guidance through mechanistic target of rapamycin

7 Kenneth Maiese

9 Abstract

10 Stem cells offer great promise for the treatment of multiple disorders throughout

11 the body. Critical to this premise is the ability to govern stem cell pluripotency,

12 proliferation, and differentiation. The mechanistic target of rapamycin (mTOR),

13 289-kDa serine/threonine protein kinase, that is a vital component of mTOR

14 Complex 1 (mTORC1) and mTOR Complex 2 (mTORC2) represents a critical

15 pathway for the oversight of stem cell maintenance. mTOR can control the

16 programmed cell death pathways of autophagy and apoptosis that can yield

17 variable outcomes in stem cell survival and be reliant upon proliferative

18 pathways that include Wnt signaling, Wnt1 inducible signaling pathway protein

19 1 (WISP1), silent mating type information regulation 2 homolog 1 (*S. cerevisiae*)

20 (SIRT1), and trophic factors. mTOR also is a necessary component for the early

21 development and establishment of stem cells as well as having a significant

22 impact in the regulation of the maturation of specific cell phenotypes. Yet, as a

23 proliferative agent, mTOR can not only foster cancer stem cell development and

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