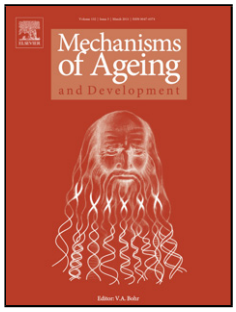

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Stem Cell Rejuvenation and the Role of Autophagy in Age Retardation by Caloric Restriction: An Update

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Highlights

- Discussing firstly the molecular interactions of caloric restriction, stem cells and autophagy.
- Illustrating the molecular mechanism of AMPK signal pathway in inducing autophagy by caloric restriction.
- Explaining how caloric restriction maintain aging stem cells regenerative ability through autophagy.
- Pointing out the importance of eliminating redundant ROS and inhibiting expression of $p16^{INK4a}$ for stem cells in switching from quiescence to senescence.
- Providing evidences that caloric restriction alleviates stem cells senescence through autophagy.

Abstract

Stem cells being pluripotent in nature can differentiate into a wide array of specific cells and asymmetrically divide to produce new ones but may undergo aging by themselves. Aging has both quantitative and qualitative effects on stem cells, and could eventually restrain them from replenishing into progenitor cells. Reactive oxygen species (ROS) accumulated in the aging cells could not only block the cell cycle but also affect autophagy by damaging the mitochondria. Autophagy could eliminate redundant production of ROS in aging stem cells and helps to maintain the proliferation capacity by restraining the expression of $p16^{INK4a}$. Current studies showed that improving autophagy could restore the regenerative ability of aging stem cells. Therefore, it is important for an organism to maintain the appropriate autophagy. Caloric restriction (CR) was shown to retard the stem cell aging by a certain basic level of autophagy, suggesting that CR was an effective way to extend longevity in mammals. However, little is known about the underlying mechanisms. In this review, we tried to explore the molecular mechanisms on how CR induces appropriate autophagy to restore aging stem cell regenerative ability.

Key words Autophagy, Caloric Restriction, Stem Cell Aging, Age retardation, ROS

Introduction

Stem cells are undifferentiated biological cells having the ability to undergo self-renewal and