

## **Skeletal muscles and satellite cells: How exercise leads to longer lives**



Satellite cell quiescence versus activation. Satellite stem (Pax7<sup>+</sup>:Myf5<sup>-</sup>) and committed cells (Pax7<sup>+</sup>:Myf5<sup>+</sup>) are able to exit the cell cycle and arrest in a reversible quiescent  $G_0$  state. Satellite stem and committed cells are primed for rapid cell cycle reentry by transitioning to a second reversible quiescent state called  $G_{Alert}$ . Committed satellite cells in GAlert begin transcribing downstream MRFs Myf5 and MyoD. Satellite cells in  $G_{Alert}$  are primed to quickly respond to regenerative demands by entering the cell cycle faster than  $G_0$  quiescent satellite cells. Active progenitor cells initiate the terminal differentiation programme to upregulate MyoG and Mrf4 in myoblasts and myocytes before fusion into myotubes. Credit: *Open Biology* (2020). DOI: 10.1098/rsob.200048

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A trio of researchers at Ottawa Hospital Research Institute has conducted a review of the ways that periodic activation of satellite cells through exercise can lessen senescence acquisition and myogenic decline. In their paper published in the journal *Open Biology*, William Chen, David Datzkiw and Michael Rudnick describe their review and what they learned about the benefits of exercise on skeletal muscle as people age.

The researchers begin their review by noting that people who keep their skeletal muscles toned tend to live longer, healthier lives. They also note that prior research has shown that <u>skeletal muscle</u> decline begins when people age into their 30s—but they also point out that muscles can be rejuvenated through healthy satellite cells. Thus, maintaining healthy muscles requires proper maintenance of satellite cells.

Satellite cells are a type of stem cell that, when they divide, produce either new satellite cells or myoblasts, which grow to become <u>muscle</u> <u>cells</u>. They can also go into a state of dormancy if the body deems them unnecessary due to a sedentary lifestyle. The researchers found that satellite cells are activated through various signaling pathways as a response to exercise. But if they remain in a <u>dormant state</u> for too long, they can become damaged as they fill with cellular trash. In their dormant state, they still produce such trash, but because they are dormant, they cannot expel it as most cells normally do. They also found that satellite cells can become "stuck" in dormancy, through disuse, leaving them permanently unable to divide. They suggest that keeping dormant satellite <u>cells</u> healthy requires regular activation.

The researchers conclude that people need to activate their muscles on a regular basis once they reach age 30, or face the possibility of losing the ability to regenerate muscle mass as they age. They also acknowledge that even with regular exercise, people will experience age-related skeletal <u>muscle</u> defects and will experience some loss in satellite cell



viability—making regular exercise all the more important for people as they grow older. They also note that there are still gaps in understanding how <u>satellite</u> cell replacement works and suggest that more research is required.

**More information:** William Chen et al. Satellite cells in ageing: use it or lose it, *Open Biology* (2020). DOI: 10.1098/rsob.200048

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