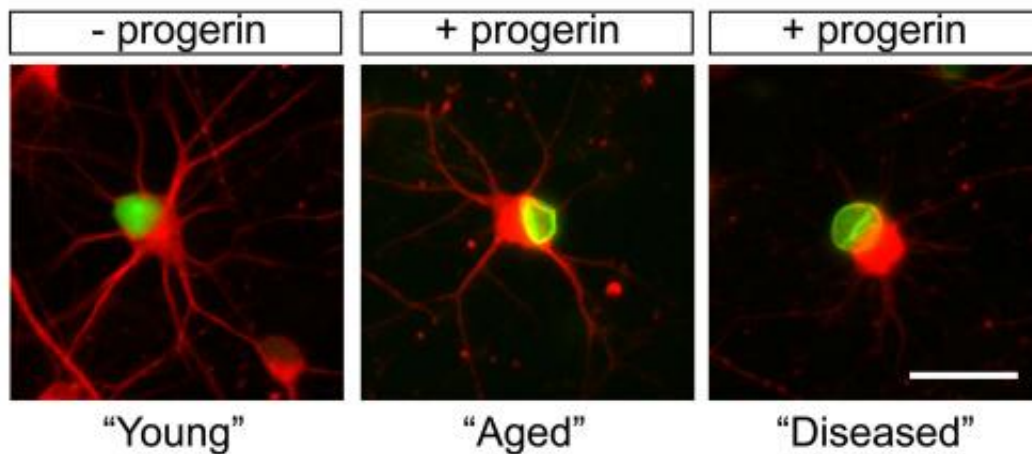


Scientists accelerate aging in stem cells to study age-related diseases like Parkinson's

December 5 2013



These are images of nerve cells under i) control conditions without PD and without progerin; ii) with progerin but no PD. iii) with both progerin and PD. Credit: *Cell Stem Cell*, Miller et al.

Stem cells hold promise for understanding and treating neurodegenerative diseases, but so far they have failed to accurately model disorders that occur late in life. A study published by Cell Press December 5th in the journal *Cell Stem Cell* has revealed a new method for converting induced pluripotent stem cells (iPSCs) into nerve cells that recapitulate features associated with aging as well as Parkinson's disease. The simple approach, which involves exposing iPSC-derived cells to a protein associated with premature aging called progerin, could enable scientists to use stem cells to model a range of late-onset

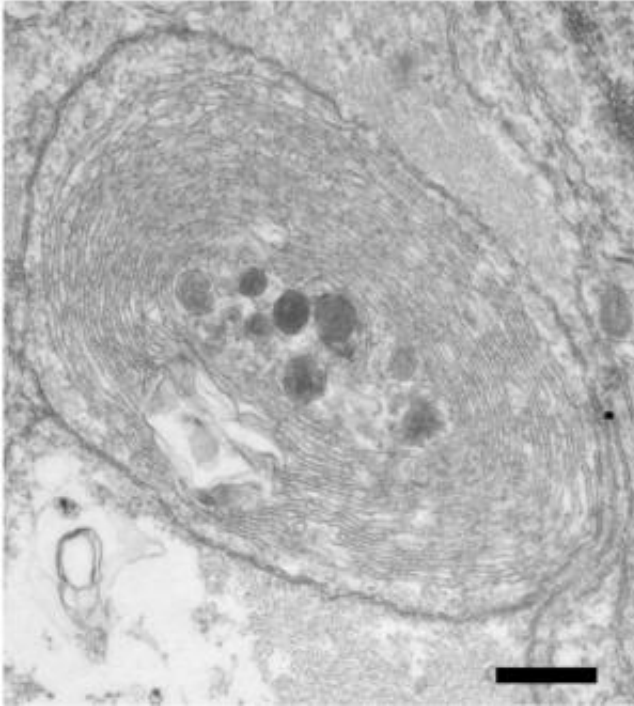
disorders, opening new avenues for preventing and treating these devastating diseases.

"With current techniques, we would typically have to grow pluripotent stem cell-derived cells for 60 or more years in order to model a late-onset disease," says senior study author Lorenz Studer of the Sloan-Kettering Institute for Cancer Research. "Now, with progerin-induced aging, we can accelerate this process down to a period of a few days or weeks. This should greatly simplify the study of many late-onset diseases that are of such great burden to our aging society."

Modeling a specific patient's disease in a dish is possible with iPSC approaches, which involve taking [skin cells](#) from patients and reprogramming them to embryonic-like stem cells capable of turning into other disease-relevant cell types like neurons or [blood cells](#). But iPSC-derived cells are immature and often take months to become functional, similar to the slow development of the human embryo. As a result of this slow maturation process, iPSC-derived cells are too young to model diseases that emerge late in life.

To overcome this hurdle, Studer and his team exposed iPSC-derived skin cells and neurons, originating from both young and old donors, to progerin. After short-term exposure to this protein, these cells showed age-associated markers that are normally present in old cells.

PD + progerin



This is an intracellular aggregate in PD neuron -- a feature only seen in PD neuron treated with progerin. Credit: *Cell Stem Cell*, Miller et al.

The researchers then used iPSC technology to reprogram skin cells taken from patients with Parkinson's disease and converted the [stem cells](#) into the type of neuron that is defective in these patients. After exposure to progerin, these neurons recapitulated disease-related features, including neuronal degeneration and cell death as well as mitochondrial defects.

"We could observe novel disease-related phenotypes that could not be modeled in previous efforts of studying Parkinson's disease in a dish," says first author Justine Miller of the Sloan-Kettering Institute for Cancer Research. "We hope that the strategy will enable mechanistic studies that could explain why a disease is late-onset. We also think that

it could enable a more relevant screening platform to develop new drugs that treat late-onset diseases and prevent degeneration."

More information: Cell Stem Cell, Miller et al.: "Human iPSC-based Modeling of Late-Onset Disease via Progerin-induced Aging."

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