ФИНАНСИРОВАНИЕ РАБОТЫ

Работа выполнена при финансовой поддержке Российского научного фонда и Санкт-Петербургского научного фонда (проект № 22-24-20122).

СОБЛЮДЕНИЕ ЭТИЧЕСКИХ СТАНДАРТОВ

Экспериментов с участием животных или людей авторы не проводили.

КОНФЛИКТ ИНТЕРЕСОВ

Авторы заявляют об отсутствии конфликта интересов.

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Partial Cell Reprogramming as a Method of Revitalizing Living Systems

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Aging and associated diseases are an acute problem of modern biology and medicine. Although aging cannot be prevented at present, its impact on the lifespan and health of the elderly can potentially be minimized by interventions aimed at returning these cellular processes to normal functioning. The ongoing search for ways to rejuvenate and improve the regenerative capacity of cells led to the discovery of partial reprogramming in 2016. Partial reprogramming is based on the short-term expression of reprogramming factors (Oct4, Sox2, Klf4 and c-Myc). As a result, the young epigenetic signature of aging cells is restored. The efficacy of the method has been shown in both in vitro and in vivo systems. In this review we discuss the main successes of partial reprogramming, as well as the problems and unresolved issues faced by the researchers. Separately, we focus on the data on molecular changes during partial reprogramming. The method of partial reprogramming provides a wide range of opportunities for fundamental research of aging and rejuvenation. Further work in this direction can lead to the development of therapeutic strategies to alleviate age-related diseases and thus improve health and longevity.

Keywords: partial reprogramming, cell identity, pluripotency, rejuvenation, somatic cells