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Summary of research interest:

Epigenetic reprogramming of aging and disease

Aging, which is the highest risk factor for most human diseases, can be defined as the progressive decline in the ability of a cell or an organism to resist damage, stress and disease. Aging has been identified as one of the major challenges of modern societies with the world population over 65 estimated to double by 2050. The process of aging is characterized by a series of molecular hallmarks including among others genomic instability, mitochondrial dysfunction, telomere shortening, cellular senescence and epigenetic alterations.

Epigenetic dysregulation during aging has been observed at multiple levels of organismal complexity ranging from lower organisms to mammals. Similarly, major epigenetic remodeling is observed during cellular reprogramming to pluripotency by expression of the Yamanaka factors (Oct4, Sox2, Klf4 and cMyc). Interestingly, rejuvenation of age-associated phenotypes has been observed during cellular reprogramming. In this line, we have previously demonstrated the amelioration of aging phenotypes and extension of lifespan in a living organism by *in vivo* cellular reprogramming.

Our group conducts research in the areas of epigenetics, stem cells, and aging. Our main goal is to investigate the role of epigenetics as driver of aging and age-associated diseases. In addition, we aim at developing novel therapeutic approaches based on epigenetic reprogramming to prevent or reverse the manifestation of aging phenotypes and improve the quality of life of people at old age. For this purpose, we use a variety of *in vitro* and *in vivo* methods in a wide range of model systems including cell culture, Caenorhabditis elegans, African turquoise killifish, and mice.

Selected publication (last five years)

Ocampo A.*, Reddy P.*, Martinez P.*, et al. (2016). In vivo amelioration of aging hallmarks by partial reprogramming. *Cell.* Dec 15; *167*(7):1719-1733.

Ocampo A., Reddy P., Izpisua Belmonte J.C. (2016). Anti-aging strategies based on cellular reprogramming. *Trends Mol Med*. Aug;22(8):725-38.

Ma H., et al. (2015). Metabolic rescue in pluripotent cells from patients with mtDNA disease. *Nature*. Aug 13; *524*(7564):234-8.

Zhang W., et al. (2015). A Werner syndrome stem cell model unveils heterochromatin alterations as a driver of human aging. *Science*. Jun 5; *348*(6239):1160-3.

Reddy P.*, Ocampo A.*, et al. (2015). Selective elimination of mitochondrial mutations in the germline by genome editing. *Cell*. Apr 23; *161*(3):459-69.