18th National and 3rd International Conference of Iranian Biophysical chemistry

هجدهمین همایش ملی و سومین همایش بین المللی بیوشیمی فیزیک ایران

25-26 Des, 2024, University of Hormozgan

۶-۵ دی ماه ۱۴۰۳، دانشگاه هرمزگان

# TP53: A Key Regulator in the Decision Between Cellular Senescence and Apoptosis

**Parisa Moghadam[1], Ali Salehzadeh-Yazdi[2], Shiva Akbari-Birgani[1]***

1. Institute for Advanced Studies in Basic Sciences, Zanjan, Iran. Parisa.moghadam@iasbs.ac.ir, sh.akbari@iasbs.ac.ir
2. Constructor University, Bremen, Germany. asalehzadehyazdi@constructor.university

## Abstract

Senescence and apoptosis are distinct cellular fates with interconnected regulatory mechanisms. While apoptosis results in rapid cell death, senescence is characterized by stable cell cycle arrest and a distinct secretory phenotype. Studies suggest that cells exposed to apoptotic stimuli can undergo senescence under certain conditions. This study aimed to identify critical regulators determining cell fate choice between senescence and apoptosis. We collected the curated gene sets from the GSEA and utilized STRING database to construct and analyze the protein-protein interaction (PPI) networks for apoptosis and senescence in cells. Functional enrichment analysis using Enrichr validated the identified networks, and then PPI network analysis using Cytoscape revealed TP53 as a protein with the highest degree of interactions and a pivotal regulator influencing cell fate. Our findings consistent with other scientific reports suggest that TP53 modulates cell cycle control mechanisms, thereby impacting the decision between senescence and apoptosis. However, further investigation is warranted to elucidate the precise role of TP53 and other regulators in this cellular fate choice.

**Key words:** Apoptosis - Senescence - TP53 - Cell cycle

## References

1.Schmitt E, Paquet C, Beauchemin M, Bertrand R. DNA-damage response network at the crossroads of cell-cycle checkpoints, cellular senescence and apoptosis. Journal of Zhejiang University. Science. B. 2007 Jun;8(6):377-397. DOI: 10.1631/jzus.2007.b0377

2. Rebbaa A, Zheng X, Chou PM, Mirkin BL. Caspase inhibition switches doxorubicin-induced apoptosis to senescence. Oncogene. 2003 May;22(18):2805-2811. DOI: 10.1038/sj.onc.1206366

3. Kumari R, Jat P. Mechanisms of Cellular Senescence: Cell Cycle Arrest and Senescence Associated Secretory Phenotype. Front Cell Dev Biol. 2021 Mar 29;9:645593. doi: 10.3389/fcell.2021.645593. PMID: 33855023; PMCID: PMC8039141.

4. Fischer, M., Sammons, M.A. Determinants of p53 DNA binding, gene regulation, and cell fate decisions. Cell Death Differ 31, 836–843 (2024). https://doi.org/10.1038/s41418-024-01326-1