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Areas of research experience: Cellular metabolism, Epigenetics, Cellular-senescence, Cancer genetics, Human Genetics.

Research interest (Briefly)-Senolytics: *Unhealthy Ageing* is the single biggest risk for different age associated diseases. Cellular senescence contributes to the unhealthy ageing and hence age associated diseases like cancer, inflammation-associated disorders leading to dementia and not to mention age associated reduction in regeneration. Therefore, one of the leading research subjects has been to get rid of senescent cells called as Senolytics. One of the ways has been to exploit the differential gene expression of these cells via post treatment (i.e. after the senescent cell formation) targeted therapy. An alternative is to develop a pre-treatment strategy to reduce, if not the prevent, senescent cell formation. Small molecule metabolites like epigenetic modulators TSA, Butyrates etc serve as promising agents to do the favour. The vast, cheap and easily available source of these small molecule modulators are the plants that are coincidently as our main food source.

"Therefore, my research interest is to perform the biochemical study of senescent cells and identify the small molecule modulators that could be used in therapeutic intervention of various age associated diseases including cancer".

Major Publication:

- MacKenzie DJ, Robertson NA, Rather MI, Adams PD (2020) DNMT3B Oncogenic Activity in Human Intestinal Cancer Is Not Linked to CIMP or BRAFV600E Mutation. iScience 23(2): 100838. doi: 10.1016/j.isci.2020.100838.
  The paper highlights that DNMT3b does not cooperate with BRAF to induce senescence bypass in CRC, though the mice come down quite early due to high tumor burden when DNMT3B is induced in BRAFV600E mutant mice.

- Rai TS, Glass M, Cole JJ, Rather MI et at. (2017) ***Histone chaperone HIRA deposits histone H3.3 onto foreign viral DNA and contributes to anti-viral intrinsic immunity. Nucleic Acids Res. The paper highlights how a histone chaperone (previously shown lack of it leads to histone loss in senescent cells and cause cancer) contributes to innate immunity against viral infection.***

• Cole JJ*, Robertson JN*, **Rather MI** et al. (2017) Diverse interventions that extend mouse lifespan suppress shared age-associated epigenetic changes at critical gene regulatory regions. * Co-1st. **Genome Biology.** ***The main outcome of this study is to highlight the role of small molecule epigenetic regulators, fasting (or caloric restriction) and catabolism inhibitors (like Rapamycin) in healthy ageing.***

Rather MI, Shivananda S. Swamy, Kodaganur S. Gopinath, and Arun Kumar (2014). Transcriptional repression of tumor suppressor *CDC73*, encoding an RNA polymerase II interactor, by WT1 promotes cell proliferation: implication for cancer therapeutics. **J. Biol. Chem.** 289, 968-976.

• **Rather MI**, Shivananda S. Swamy, Kodaganur S. Gopinath, and Arun Kumar. (Jan 2013) Oncogenic microRNA-155 downregulates tumor suppressor *CDC73* and promotes oral squamous cell carcinoma cell proliferation: Implications for cancer therapeutics. **J. Biol. Chem.**288, 608–618.