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Press Release

JMI researchers develops genetically engineered stem cell-based therapy

Researchers from the Multidisciplinary Centre for Advanced Research & Studies (MCARS), Jamia Millia Islamia (JMI) have developed genetically engineered stem cells for the treatment of infectious and inflammatory diseases. The research team led by Dr. Tanveer Ahmad has shown that stem cell-based therapies can alleviate inflammatory conditions during infectious diseases such as COVID-19.

The study has first elucidated the cause of cellular damage caused by SARS-CoV-2 and its proteins in lung cells and then designed an innovative approach to create engineered stem cells. These stem cells when introduced into model cellular systems demonstrate therapeutic efficacy by alleviating pro-inflammatory mitochondrial DNA (mtDNA) release, which has clinically been shown to cause the disease. The therapeutic effect was shown to be mediated by the direct transfer of the healthy mitochondria from stem cells to infected lung cells via membrane nanotubes and restore their function. These cells were named 'IMAT-MSCs' (intercellular mitochondrial transfer-assisted therapeutic mesenchymal stem cells).

The first author of the study, Md. Imam Faizan said that IMAT-MSCs have shown impressive therapeutic efficacy and they will take their study to preclinical models of infectious and inflammatory lung diseases soon.

Dr. Tanveer Ahmad said that this is the first time it has been demonstrated at the clinical and molecular level how inflammatory and apoptosis-inducing mtDNA is released from the cell mitochondria. Scientists have been trying to identify the molecular pathway that leads to mtDNA release from mitochondria matrix, and this is the first study to show

that mitochondria from the inner membrane vesicles package their DNA and extrude it out of the organelle which is eventually secreted extracellularly.

Prof. Mohammad Zulfequar, Director MCARS, congratulated all the authors of the study and said that such innovative studies where a concept is taken from the bench to bedside are much needed approaches to treat a vast repertoire of human diseases, even aside from infectious diseases like COVID-19.

Dr. S.N. Kazim, the deputy director of the centre also highlighted the translational potential of this innovative cell-based therapy developed by MCARS researchers in collaboration with clinicians. Dr. Kazim said that as the world is embracing the next revolution of cellular therapies like CAR-T cells, which demonstrate remarkable and durable response against relapsed and refractory blood cancer, the cell-based approach used in this study further proves the enormous translational potential of cellular-therapies.

Dr. Tanveer Ahmad also acknowledges the contribution from Dr. Soumya Sinha Roy (Senior Scientist, CSIR-IGIB), Dr. Pankaj Seth (Professor, NBRC), Dr. Rituparna Chaudhuri (Postdoctoral Fellow, NBRC), Dr. Jawed Iqbal (Scientist, MCARS), Dr. Mohan C Joshi (Assistant Professor, MCARS), Dr Shakti Sagar (PhD, CSIR-IGIB), , Gaurav Kharya (BMT Head, Apollo hospital), Dr. Rohit Kumar (Clinician, Safdarjung Hospital), Dr. Syed Mansoor Ali (Assistant Professor, JMI) and Dr. Sarah Albogami (Assistant Professor, Taif University Saudi Arabia). The study was published in the peer reviewed journal "Cells" from MDPI.

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