Notification No: 596/2026

Date of Award: 23.02.2026

Name of the Scholar: Jayesh Kumar Sevak

Name of the Supervisor: Prof. Syed Naqui Kazim

Name of the Co-Supervisor: Prof. Nirupama Trehanpati and Prof. Shiv Kumar Sarin

Name of the Department/ Centre: Centre for Interdisciplinary Research in Basic Sciences

Topic of Research: Immuno-metabolic requirement of HBsAg Seroconversion in HBV reactivation patients.

Finding

Hepatitis B virus reactivation (rHBV) represents a major clinical challenge, yet the immunometabolic determinants of viral control and HBsAg seroconversion remain poorly defined. Here, we performed integrated immunophenotyping, single-cell transcriptomics, metabolomics, cytokine-profiling, and viral sequencing to dissect immune regulation in chronic-HBV (CHBV) and rHBV patients, with emphasis on eAg status and seroconversion.

We demonstrate that eAg^{-} patients and sAg seroconverters exhibit early $CD8^{+}$ T-cell activation, expansion of effector memory subsets, and enhanced cytotoxic and polyfunctional responses. These immune features are supported by coordinated metabolic fitness, including preserved oxidative phosphorylation, NAD^{+} metabolism, and balanced glycolytic–mitochondrial coupling via GLUT1, HK2, LDHB, and mTOR signaling. In contrast, eAg^{+} patients and non-seroconverters display impaired activation, persistent exhaustion (PD-1, CTLA-4), and glycolytic overreliance without mitochondrial support, indicating metabolic dysfunction.

Single-cell and cytokine analyses reveal activation of TCR, mTOR/AMPK, and Th17 pathways in seroconverters, alongside a regulated inflammatory milieu that promotes antiviral immunity. Viral sequencing showed no major resistance mutations, implicating host immune regulation as the primary determinant of outcome.

Collectively, our findings identify eAg as a key immunometabolic regulator and establish metabolic reprogramming as a central driver of T cell function, offering therapeutic avenues to restore immune competence and achieve functional cure in HBV.