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Decreased NK cell-mediated cytotoxicity is associated with hypoalbuminemia in hemodialysis patients

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Objectives : The significance of Natural Killer (NK) cells in cancer immunity and immunotherapy has garnered substantial attention. Impaired NK cell function can severely compromise the host's immune system. End-stage kidney disease (ESKD) and hemodialysis (HD) are known among various factors contributing to NK dysfunction. Nonetheless, the precise mechanisms underpinning this phenomenon remain insufficiently elucidated.

Methods : We conducted a comprehensive multivariate and comparative analysis of NK cell subtypes and surface receptors across different age and gender categories in healthy donors (HC). Furthermore, we compared these parameters in HD patients to healthy controls. Additionally, NK cell cytotoxicity between HD patients and HC is assessed. The study also examines the biochemical data in HD patients with varying levels of NK cell cytotoxicity.

Results : The analysis of NK cells in 44 HC reveals age-related increases in the proportions of total NK cells, CD56dim cells, and CD56dimCD16bright cells, accompanied by reductions in CD56bright cells and CD56dimCD16dim cells. Gender differences were not observed. Among 30 age-matched HD patients and 30 HC individuals, CD56bright cells increased, while CD56dim cells decreased in HD patients. As a result, premature aging-related NK cell phenotypes were not observed in HD patients. Nevertheless, HD patients exhibit reduced NK cell cytotoxicity across all four effectors: target ratios. Furthermore, a comparison within the HD patient group, distinguishing those with high and low cytotoxicity (7 in the former, 11 in the latter), reveals higher albumin levels in the high cytotoxicity group.

Conclusions : This study uncovers significant functional impairment in NK cell cytotoxicity between HD patients and healthy individuals. Impaired cytotoxicity among HD patients is attributable to malnutrition, possibly mediated by hypoalbuminemia. This research is the first to elucidate the connection between serum albumin levels and NK cell dysfunction in ESKD.