Use of inhibitors and cell based therapies to combat a fatal immune response in COVID-19

Tech ID: 32078 / UC Case 2020-460-0

BACKGROUND

UC researchers sought to define the host immune response, the “cytokine storm” , that has been implicated in fatal COVID-19 using an AI-based approach. Over 45,000 publicly available transcriptomic datasets of viral pandemics were analyzed to extract a 166-gene signature. The signature was surprisingly conserved in all viral pandemics, including COVID-19, inspiring the nomenclature ViP-signature. A subset of 20-genes classified disease severity in respiratory pandemics. The ViP signatures pinpointed airway epithelial and myeloid cells as the major contributors of an IL-15 cytokine storm, and epithelial and NK cell destruction as determinants of severity/fatality. They also helped formulate precise therapeutic goals to reduce disease symptoms and severity. Thus, the ViP signatures provide a quantitative and qualitative framework for titrating the immune response in viral pandemics and may serve as a powerful unbiased tool in our armamentarium to rapidly assess disease severity and vet candidate drugs.

TECHNOLOGY DESCRIPTION

Fatal COVID-19 is characterized by a paradoxical immune response, i.e., suppression of epithelial and NK cell functions (immunosuppression) in the setting of a cytokine storm (overzealous immune response). Used here is an informatics approach, i.e., Boolean Equivalent Correlated Clusters (BECC)25, which can identify fundamental invariant (universal) gene expression relationships underlying any biological domain. By selecting the biological domain of 'respiratory viral pandemics characterized by high case fatality rates’ and using the vast amount of publicly available data from prior such pandemics, the BECC approach can model features of Covid-19. Targeting the appropriate cell pathway may serve as a promising strategy to tackle the central immunopathologic feature in severe COVID-19. These findings are consistent with the emerging reports that NK cells are significantly exhausted and reduced in cases of severe COVID-19 infection and that such reduction was seen as early as 3-6 days after the onset of symptoms. In fact, these observations have inspired clinical trials either replenishing the number or function of NK cells. The ViP signatures pinpointed airway epithelial and myeloid cells as the major contributors of a cytokine storm, and epithelial and NK cell destruction as determinants of severity/fatality. They also helped formulate precise therapeutic goals to reduce disease symptoms and severity. Thus, the ViP signatures provide a quantitative and qualitative framework for titrating the immune response in viral pandemics and may serve as a powerful unbiased tool in our armamentarium to rapidly assess disease severity and vet candidate drugs.

INTELLECTUAL PROPERTY INFO

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OTHER INFORMATION

CATEGORIZED AS

- **Medical**
  - Disease: Infectious Diseases
  - Disease: Respiratory and Pulmonary System

RELATED CASES

2020-460-0

A patent application has been filed.

PATENT STATUS

Patent Pending

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