Docket #: S17-443

Methods to improve phagocytosis for treatment of age-related diseases

Stanford researchers have patented methods to improve phagocytosis, the process by which macrophages clear protein aggregates, dying cells, and debris, to treat age-related diseases. This clearance process deteriorates with aging and in diseases like Alzheimer's, macular degeneration, and cancer. In Alzheimer's, microglia fail to remove extracellular plaques efficiently, leading to inflammation and cognitive decline. The researchers found that blocking CD22 restores microglial phagocytosis, reverses neuroinflammatory gene signatures, and improves cognitive function in aged mice. This technology provides a potential treatment for improving phagocytosis and treating multiple age-related diseases.

Stage of research
The inventors have shown that blocking CD22 rescues phagocytosis in aged microglia. Further therapeutic development is ongoing.

Applications

- Treatment of age-related diseases, including:
  - Alzheimer's disease
  - Parkinson's disease
  - Amyotrophic lateral sclerosis (ALS)
  - Macular degeneration
  - Cancer
  - Other age-related diseases

Advantages

- Provides a much-needed method to improve phagocytosis in aged macrophages
- In the aging brain, restoration of microglial phagocytosis is accompanied by reduced inflammation and improved cognitive function
- Targets the phagocytic cell rather than the phagocytic prey
- Potentially generalizable to a diverse range of age-related diseases in many organs
- New therapeutic target
- CD22 is only expressed on aged macrophages, not young macrophages
- Can be used in combination therapy to improve the magnitude and duration of disease-ameliorating phagocytosis
- Mimics pro-phagocytic mechanism of young serum

Publications

- J.V. Pluvinage, M.S. Haney, B.A.H.Smith, J. Sun, T. Iram, L. Bonanno, L. Li, D.P. Lee, D.W. Morgens, A.C. Yang, S.R. Spuken, D. Gate, M. Scott, P. Khatri, J. Luo, C.R. Bertozzi, M.C. Bassik, T. Wyss-Coray CD22 blockade restores homeostatic microglial phagocytosis in the aging brain *Nature* April 11, 2019 Vol 568.

Patents

- Published Application: WO2019126725
- Published Application: 20200317778
- Published Application: 20240287175
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