METHOD FOR INCREASING THE STORAGE LIFE OF DONATED RED BLOOD CELLS

OU ID: #20026

Overview

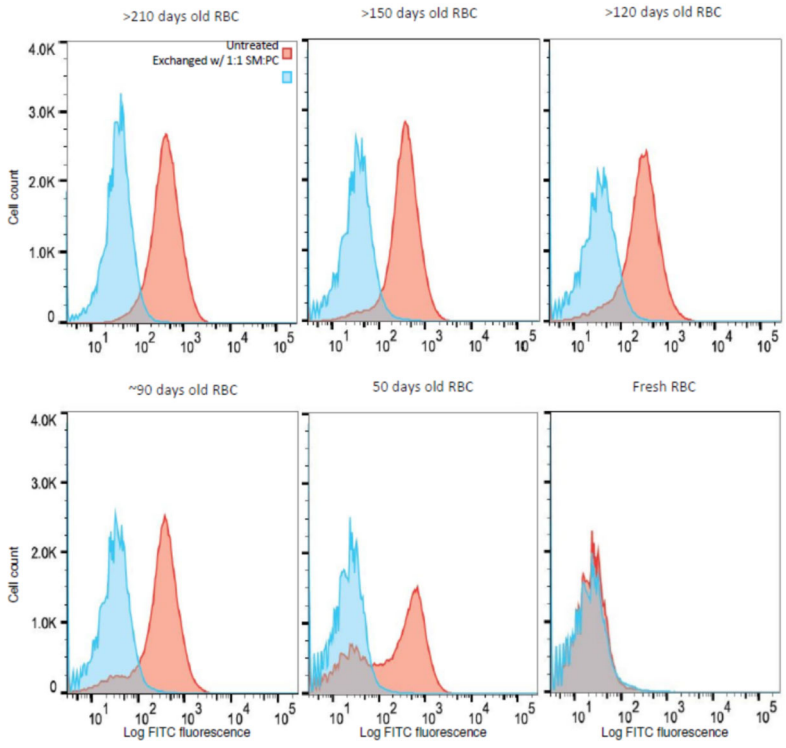
Every day in the U.S., approximately 36,000 units of red blood cells are needed. Blood donations are used to treat cancer, chronic illnesses, traumatic injuries and to replace blood lost during surgical procedures. These donations come from volunteers, an estimated 6.8 million in the U.S. each year. Unfortunately, there are shortages because only 3% of age-eligible people donate blood annually[1]. These shortages are further exacerbated by things such as weather and natural disasters[2]. Currently, the coronavirus outbreak is threatening the blood supply after the cancelation of nearly 2,700 Red Cross blood drives, resulting in roughly 86,000 fewer donations[3].

Red blood cells have a limited shelf life after donation and must be used in 42 days or less[1]. In the absence of an increase in donations, the only way to increase the availability of red blood cells is to increase their shelf life. Research in the lab of Dr. Amir Farnoud at Ohio University has found a method to do just that.

Benefits

As red blood cells age, lipids in the outer leaflet of the cell membrane signal macrophages to ingest the cells at the end of their lifespan. Because this occurs faster in storage than in the human body (42 days vs. 120 days), a number of transfused cells are unavailable to the patient because they are immediately cleared by macrophages upon infusion. The method developed by Dr. Farnoud "hides" the donor red blood cells from macrophages by exchanging the membrane lipids.

Current data show that a significantly lower number of red blood cells are taken up by macrophages after being treated using this new method. Experiments have tested this as far out as 210 days in storage, a 5x increase in shelf life.



Commercial Application

Having a robust, dependable supply chain that is able to get donated red blood cells to where it is needed in sufficient amounts is directly related to the availability of the product. Absent a significant increase in the number of donors or the development of an effective substitute, this can be accomplished by extended the shelf life of available red blood cells. Dr. Farnoud's method provides an opportunity to address this need for both civilian and military populations.

Patent Status

U.S. Provisional Patent Application filed April 27, 2020.

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About the Inventors

Dr. Amir Farnoud joined the Department of Chemical and Biomolecular Engineering in August 2015. Dr. Farnoud received his Ph.D. in Chemical and Biochemical Engineering from the University of Iowa and completed his post-doctoral training in the department of Microbiology and Immunology at SUNY-Stony Brook. His research group aims to understand the role of cell membrane lipid composition in cell-cell and cell-nanomaterial interactions.

Amid Vahedi received a B.S. in Chemical Engineering from Petroleum University of Technology and a M.S. in Chemical Engineering from Sharif University of Technology. He is currently a graduate student in Dr. Farnoud's lab, pursuing a Ph.D. in Chemical Engineering. He works on technologies for exchanging the lipids in the membrane of living cells, especially red blood cells, to examine the role of lipid chemistry and biophysical properties in red blood cell function.

References

[1]Facts About Blood Supply in the U.S.

[2]Stat News

[3]American Red Cross

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