Abstract:

Platelet and blood transfusions have vital importance to the lives of many patients. Platelet transfusions are a life-saving intervention by reducing risk of bleeding in thrombocytopenic patients. Due to the short shelf life of platelets and their limited availability, researchers have developed various platelet transfusion production technologies. Understanding the cellular and biophysical mechanisms of platelet release is particularly important for development of platelet transfusion products (PTPs) and to translate them to clinical applications in patients requiring platelet infusion. Similarly, due to donor dependence and increased clinical need of blood transfusions, studies on the erythroid transfusion products (ETPs) have recently gained momentum. This led to development of ETP technologies involving differentiation of stem cells to fully functional erythrocytes in vitro. During megakaryopoiesis or erythropoiesis, various stimulatory factors, growth factors, transcription factors, and biophysical conditions have been shown to play a crucial role in the formation final blood products. Thus, understanding of the in vivo mechanisms of platelet release and erythrocyte maturation is particularly important for mimicking these conditions in vitro. This review focuses on latest and up-to-date information about the innovations in PTP and ETP technologies. We also discuss some of the recent fundamental findings that have changed our understanding of in vivo platelet release and blood formation. Human bone marrow acts as a source of cells required for erythropoiesis and megakaryopoeiesis. Understanding of molecular mechanism and physiology of these vital and curitial events allowed us to mimic these conditions ex vivo and to develop artificial platelet and erythroid transfusion production technologies.

Reference:

Meric, N., Guney Esken, G., Uslu, M. and Kocabas, F. (2019) Developments in Artificial Platelet and Erythroid Transfusion Products. Advances in Experimental Medicine and Biology. December 5th. doi: 10.1007/5584_2019_455. (Epub ahead of print).