The Impact of Activated Platelet Transfusion on Hematology-Oncology Patient Care

E. Maurer-Spurej1,2,3, D. Millar2
1University of British Columbia, 2LightIntegra Technology Inc, 3Canadian Blood Services

Introduction
The activation of platelets is a well documented phenomenon. It is clear that many donated platelet transfusions contain activated platelets. This situation can lead to serious implications for the treatment of hematology-oncology patients who are dependent on platelet transfusion support during their treatment. This white paper will introduce activated platelets and their prevalence, discuss the impacts of activated platelet transfusions, and present a practical solution to this situation.

Activated Platelets
Platelet activation refers to the transition of resting, discoid platelets to dendritic spheres. This phenomenon occurs in response to a variety of stressors, is reversible to a certain extent, and does not necessarily culminate in clot formation1. Evidence is accumulating that the primary source for activated platelets in a platelet transfusion is the donor. The donor’s immunological and inflammatory state at the time of donation appears to influence the activation status of their platelets2. These donor factors are often asymptomatic and are not caught in donor screening resulting in a surprisingly high number of activated platelets being transfused. The rate of activated platelets ranges between 30% and 50% of the platelet inventory3. Activation rates falling in this range have been observed across North America and Europe.

Activated Platelets and Refractoriness
Transfusions with activated platelets tend to result in lower count increments3. Hospitals that transfused exclusively non-activated platelets to their hematology-oncology patient populations have seen drastic reductions in the rate of patients requiring massive transfusion support, and the average number of transfusions per patient4. The above observations have been attributed to interactions between activated platelets and the recipient’s innate immune system. In particular, complement opsonization may be the cause of many otherwise unexplained occurrences of platelet refractoriness.

Activated Platelets and Immunotherapy
In addition to the implications of activated platelets on platelet refractoriness, a growing body of literature is suggesting activated platelets may interfere with certain immunotherapies. It was shown that activated platelets contain various upregulated factors, suggesting that platelets may be highly immunomodulatory. Specifically TGFβ4, IL-65, CD40L6 and complement7 are found in conjunction with activated platelets. This serves to add complexity to the treatment of already very complex patients.

Practical Solutions
To reduce the complexity and risk associated with activated platelet transfusions it is recommended to transfuse hematology-oncology patients with exclusively non-activated platelets. This is most practically achieved through routine screening of platelet transfusions in the hospital blood bank. Selective allocation and transfusion of non-activated platelets to hematology-oncology patients promises to significantly improve patient care.

References
5. Increased tumor necrosis factor alpha (TNF alpha), interleukin 1, and interleukin 6 (IL-6) levels in the plasma of stored platelet concentrates: relationship between TNF alpha and IL-6 levels and febrile transfusion reactions. Transfusion 1999; 33: 195-9.