Innovation Summary

TREATING ALLOIMMUNIZATION IN TRANSFUSION AND PREGNANCY

To learn more

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BACKGROUND: In the US alone, approximately 15,000,000 units of human red blood cells (RBCs) are transfused each year. In addition to the well known ABO antigens, there are in excess of 340 known alloantigens on human RBCs, which each may vary from person to person. As such, essentially every unit of non-autologous blood that is transfused represents a source of alloantigen(s) against which a transfusion recipient may mount an antibody response. For many alloantigens, once an antibody is formed against it, then the patient is no longer able to safely receive RBCs that express that antigen.

PROBLEM 1: For some patients who undergo chronic transfusion (e.g. sickle cell disease, beta thalassemia), and who become alloimmunized to multiple antigens, it becomes increasingly difficult to find units of blood that they can receive. This leads to substantial delays in meeting the transfusion needs of these patients, comes at a large financial cost, and in extreme cases leads to the death of the patient due to inability to find a unit of blood they can receive.

PROBLEM 2: "Hemolytic disease of the fetus and newborn" can occur when women become alloimmunized to paternally inherited RBC antigens that are expressed by fetal RBCs. This disease can result in severe health and developmental problems for the child as a result of *in utero* hemolysis, or even render a couple incapable of having a viable pregnancy.

SOLUTION: Bloodworks has developed a technology in which one can "turn off" the alloantibody response in an already alloimmunized patient, allowing for both lifesaving blood transfusion therapy and viable pregnancy. In this technology, blood group antigens are expressed recombinantly, and given to the patient in large intravenous doses. This is analogous to giving large doses of factor VIII to tolerize hemophilia patients.

ADVANTAGES:

1. Massive doses of RBCs given to alloimmunized patients would cause death through hemolysis. However, by separating the RBC antigen from the RBC and expressing it in soluble form, we have circumvented this limitation.
2. This technology involves an antigen specific immune modulation that does not affect the normal function of the immune system (i.e. to fight off infectious pathogens).
3. This approach is more broadly applicable to alloantigens on non-RBC cells (e.g. human platelets and HLA).

PARTNERSHIP OPPORTUNITIES:

- Collaborative research and development opportunities
- Licensing agreement
- Clinical trial support

Patent Pending: US20190046620A1 Therapeutic Induction of Tolerance Using Recombinant Cell Surface Antigens