Docket #: S23-183

Method and Composition for Assessing and Enhancing the Durability of Antibody Response to Vaccination

The limited duration of humoral responses to vaccination is a key issue in the fight against infectious diseases, as antibody levels wane over time, leaving individuals vulnerable to reinfection. Thrombopoietic activity refers to the physiological process by which the body produces platelets. During thrombopoiesis, mature polyploid megakaryocytes undergo cytoplasmic fragmentation to give rise to small anucleate cell fragments called platelets. As platelets mature, cytosolic RNA gradually degrades, resulting in mature RNA-free platelets.

Thrombopoietin (TPO) is the primary cytokine that regulates thrombopoietic activity. TPO binds to its receptor on the surface of megakaryocytes, leading to activation of signaling pathways that promote the proliferation, differentiation, and cytoplasmic fragmentation of megakaryocytes. The Pulendran Lab at Stanford have previously validated that the changes in RNA content in platelets are consistent with changes in thrombopoietic activity, i.e. the generation of new platelets from megakaryocytes from bone marrow. They demonstrated that transcriptional signatures of platelet activation correlate with and are predictive of the durability of antibody responses to vaccination.

In the current invention, the Pulendran Lab demonstrate: (1) a simple flow cytometry-based assay using blood samples to define a cell-based signature of durability and (2) that increasing thrombopoietic activity enhances the durability of antibody response to vaccination. This invention provides a method to assess the durability of waning antibody responses and to enhance the durability of antibody responses to vaccination. This is accomplished by increasing thrombopoietic activity through the administration of thrombopoietin protein; mRNA-based or DNA-based

vectors expressing thrombopoietin; or small or large molecules that activate thrombopoietic activity. By assessing and enhancing both the magnitude and durability of antibody responses to vaccination, this invention offers the potential for long-term protection against infectious diseases.

Applications

- Deliver thrombopoietin or mimetics as a protein or RNA or DNA to promote durable immune responses to vaccines
- Flow cytometry-based assay for cellular research
- Vaccine research
- Immuno-therapies

Advantages

- Currently there are no strategies to specifically enhance the durability of antibody responses to vaccination
- Long-term protection against infectious diseases
- Compatible with thrombopoietin or mimetics

Patents

- Published Application: WO2024233353
- Published Application: 20260315570

Innovators

- Bali Pulendran
- Sheng-Yang Wu

Licensing Contact

Minxing Li

Licensing and Strategic Alliances Manager

Email