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Cryopreservation of red blood cells in support of development and evaluation of current and emerging diagnostic tests for glucose-6-phosphate dehydrogenase deficiency

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Glucose-6-phosphate dehydrogenase (G6PD) deficiency is characterized by abnormally low levels of G6PD activity. Individuals with diminished G6PD activity are susceptible to cellular oxidative damage, and anti-malarial drugs such as those in the 8-aminoquinolone group (e.g., primaquine, pamaquine, and tafenoquine) can cause acute hemolysis. These drugs are critical for radical cure of *Plasmodium vivax*. There is a need for point-of-care G6PD deficiency tests to support treatment of patients with these drugs. Using cryopreserved samples with known G6PD phenotype and genotype will help with the development and evaluation of current and new G6PD tests. We evaluated the feasibility of developing a G6PD specimen repository by cryopreservation of red blood cells. The current repository constitutes specimens from adults of known G6PD-deficient populations with diverse ethnic backgrounds. Standard operation procedures and formulations have been optimized to allow cryopreservation of red blood cells with stabilized G6PD activity within the red blood cell. Flow cytometry and kinetic assays demonstrate that specimens can be preserved for a minimum of 6 months under these optimized conditions. Critically, thawed samples demonstrate stability for seven days. We demonstrate by quantitative and qualitative G6PD enzyme activity assays the feasibility of this approach. Furthermore, we demonstrate by flow cytometry that G6PD activity distributions in red blood cells are also preserved.

Biography

Maria Kahn is a Senior Research Associate in Product Development at PATH. She specializes in developing technologies for the preservation of biological specimens. Those specimens include red blood cells, yeast cells and recombinant proteins. She was influential in setting up the repository for the preserved red blood cells and continues to maintain the repository.

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