Glucose-6-phosphate dehydrogenase enzyme stability in filter paper dried blood spots

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Glucose-6-phosphate Dehydrogenase Enzyme Stability in Filter Paper Dried Blood Spots

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Abbreviations: G6PD, Glucose-6-phosphate Dehydrogenase; DBS, Dried Blood Spot; CDC, Centers for Disease Control and Prevention; NSQAP, Newborn Screening Quality Assurance Program; PT, Proficiency Testing; RUSP, United States Recommended Uniform Screening Panel

Highlights:

- Glucose-6-phosphate dehydrogenase dried blood spots are stable at -20^{0}C for a year
- Humidity exacerbates decline in enzyme activity with increasing temperature
- Glucose-6-phosphate dehydrogenase proficiency testing materials are available

Abstract

Objective: Prior to initial distribution of Glucose-6-phosphate dehydrogenase (G6PD) proficiency testing (PT) materials, we evaluated G6PD enzyme stability in dried blood spots (DBS) under various temperature and humidity environments to develop storage and usage guidelines for our new materials.

Design & Methods: We prepared fresh G6PD-normal DBS materials and conducted stability evaluations of daily use and short and long-term storage under various temperature and humidity environments.

Results: G6PD DBS PT materials retained 92% of initial activity after 30 days of use at 4^{0}C. Materials stored at -20^{0}C and 4^{0}C with desiccant for 30 days retained 95% and 90% of initial activity, respectively. When stored for one year at -20^{0}C or six months at 4^{0}C specimens retained >90% of initial activity. Specimens stored at 37^{0}C with desiccant lost 10% activity in three days. At the end of 30 days, specimens stored under 'Extreme'—humidity >50% without desiccant— conditions at 37^{0}C assayed below the NSQAP cut off for G6PD. Humidity exacerbated loss of enzyme activity with increasing temperature and time duration.

Conclusion: Data suggest that G6PD PT materials can be stored at 4^{0}C and used for up to one month and can be stored at -20°C for one year and yield >90% enzyme activity. Exposure to warm temperatures, especially with elevated humidity, should be avoided. Desiccant should always be used to mitigate humidity effects.

Keywords: Glucose-6-phosphate Dehydrogenase; Newborn Screening, Dried Blood Spot; Proficiency Testing; Stability