One-Step DNA Extraction from Dried Blood Spots for Newborn Screening

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WARF: P100253US02

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an efficient, one-step method for extracting DNA from blood samples, particularly dried blood samples.

Overview

Newborn screening is the practice of testing newborns for certain harmful or potentially fatal disorders that are not otherwise apparent at birth. Generally, blood drops are obtained from the heel, finger or ear and then absorbed onto filter paper to produce a dried blood spot collection card. The dried blood spots then are tested for a variety of individual diseases and conditions, including those of metabolic, genetic or hormonal origin. This testing saves millions of dollars each year in health care costs for people who would suffer the long-term effects of these disorders if not treated upon birth.

Many of the tests measure enzymes or metabolites in the blood by immunoreaction or tandem mass spectrometry. However, with the growing number of identified DNA biomarkers for genetic disorders, isolating DNA from the dried blood spots is increasingly desirable. But the isolation of DNA from dried blood samples is a laborious process involving multiple buffers and multiple pipetting and aspiration steps and is not amenable to a high throughput format and automation. In addition, blood can contain contaminants that can interfere with subsequent analysis steps. DNA quality is particularly important in the analysis of single copy number genes for which the signal-to-noise ratio is significant. Improved methods for the rapid, low cost extraction of DNA from blood samples are needed.

The Invention

A Wisconsin researcher has developed a one-step method for eluting DNA from a blood sample. The method involves using a DNA elution solution and agitating the blood sample in the solution with heat. The purified DNA is suitable for use in techniques such as enzymatic DNA amplification and real-time PCR.

Applications

- Newborn screening for genetic disorders such as severe combined immunodeficiency disease (SCID), cystic fibrosis, Sickle Cell disease or galactosemia
- Forensic science

Key Benefits

- Cuts sample preparation time in half
- Easily automated
- Eliminates numerous wash steps, reducing costs
- Expected to improve lab test turnaround time
- No detrimental effect on signal-to-noise ratio
- Eluted DNA solution does not interfere with the enzymes used for DNA amplification.

Stage of Development

This method was successfully used to extract DNA for a screening test to identify those suffering from SCID.

Publications

- Baker et al. 2009. Development of a Routine Newborn Screening Protocol for Severe Combined Immunodeficiency. J. Allergy Clin. Immunol. 124, 522-527.
- Baker et al. 2010. Implementing Routine Testing for Severe Combined Immunodeficiency within Wisconsin's Newborn Screening Program. Public Health Rep. 125 Suppl 2, 88-95.
- Verbsky et al. 2012. Newborn Screening for Severe Combined Immunodeficiency; The Wisconsin Experience (2008-2011). J. Clin. Immunol. 32, 82-88.

Tech Fields

- Medical Devices : Diagnostics & monitoring tools

For current licensing status, please contact Jennifer Gottwald at jennifer@warf.org or 608-960-9854