Journal of Diabetes Science and Technology
Volume 4, Issue 4, July 2010

ORIGINAL ARTICLES

Proficiency Testing of Human Leukocyte Antigen-DR and Human Leukocyte Antigen-DQ Genetic Risk Assessment for Type 1 Diabetes Using Dried Blood Spots

Paul Dantonio, M.S.,[1] Nancy Meredith-Molloy, B.S.M.T., M.T.(ASCP),[1] William A. Hagopian, M.D., Ph.D.,[2] Jin Xiong She, M.D., Ph.D.,[3] Beena Akolkar, Ph.D.,[4] Suzanne K. Cordovado, Ph.D.,[1] Miyono Hendrix, B.S.,[1] L. Omar Henderson, PhD.,[1] W. Harry Hannon, Ph.D.,[1] and Robert F. Vogt, Ph.D.[1]

Abstract

Background:
The plurality of genetic risk for developing type 1 diabetes mellitus (T1DM) lies within the genes that code for the human leukocyte antigens (HLAs). Many T1DM studies use HLA genetic risk assessment to identify higher risk individuals, and they often conduct these tests on dried blood spots (DBSs) like those used for newborn bloodspot screening. One such study is The Environmental Determinants of Diabetes in the Young (TEDDY), a long-term prospective study of environmental risk factors. To provide quality assurance for T1DM studies that employ HLA genetic risk assessment, the Centers for Disease Control and Prevention (CDC) conducts both a voluntary quarterly proficiency testing (VQPT) program available to any laboratory and a mandatory annual proficiency testing (PT) challenge for TEDDY laboratories.

Methods:
Whole blood and DBS samples with a wide range of validated HLA-DR and HLA-DQ genotypes were sent to the participating laboratories. Results were evaluated on the basis of both the reported haplotypes and the HLA genetic risk assessment.

Results:
Of the reported results from 24 panels sent out over six years in the VQPT, 94.7% (857/905) were correctly identified with respect to the relevant HLA-DR or HLA-DQ alleles, and 96.4% (241/250) were correctly categorized for risk assessment. Significant improvement was seen over the duration of this program, usually reaching 100% correct categorization during the last three years. Of 1154 reported results in four TEDDY PT challenges, 1153 (99.9%) were correctly identified for TEDDY eligibility.

continued →

Author Affiliations: [1]Division of Laboratory Sciences, Centers for Disease Control and Prevention, Atlanta, Georgia; [2]Pacific Northwest Diabetes Research Institute, Seattle, Washington; [3]Medical College of Georgia, Augusta, Georgia; and [4]National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, Bethesda, Maryland

Abbreviations: (CDC) Centers for Disease Control and Prevention, (DBS) dried blood spot, (DKA) diabetic ketoacidosis, (FDR) first-degree relative, (HLA) human leukocyte antigen, (MHC) major histocompatibility complex, (NBS) newborn bloodspot screening, (PT) proficiency testing, (T1DM) type 1 diabetes mellitus, (TEDDY) The Environmental Determinants of Diabetes in the Young, (VQPT) voluntary quarterly proficiency testing

Keywords: newborn screening, quality assurance, quality control, The Environmental Determinants of Diabetes in the Young

Corresponding Author: Robert F. Vogt, Ph.D., Division of Laboratory Sciences, Mailstop F19, Centers for Disease Control and Prevention, 4770 Buford Hwy., Atlanta, GA 30341; email address rvogt@cdc.gov

Abstract cont.

Conclusions:
The different analytical methods used by T1DM research centers all provided accurate (>99%) results for genetic risk assessment. The two CDC PT programs documented the validity of the various approaches to screening and contributed to overall quality assurance.

J Diabetes Sci Technol 2010;4(4):929-941