Triplex tandem mass spectrometry assays for screening of 3 lysosomal storage disorders in a Korean population

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Background : We evaluated the performance of triplex tandem mass spectrometry (MS/MS) assays using dried blood spots for screening of 3 lysosomal storage disorders (LSDs), namely, Pompe, Fabry, and Gaucher diseases.
Methods : Chromatographic separation was completed using mobile phase involving water-formic acid and acetonitrile-formic acid over 2.3 min of run time on a column with Acquity UPLC CSH C18 column (Waters, USA). The detection of column effluent was performed using TQD triple quadrupole mass spectrometer (Waters, USA) in the multiple-reaction-monitoring mode. We evaluated the precisions of 3 enzyme assays (acid alpha glucosidase, acid alpha galactosidase, acid beta glucocerebrosidase) at four activity levels (base, low, medium, and high). We evaluated the linearity, limit of detection, recovery, carryover, and ion suppression. We analyzed the 3 enzyme activities in 376 anonymous newborn dried blood spots (DBS). Control materials were provided from Centers for Disease Control and Prevention (CDC).
Results : Intra- and inter-assay precisions were between 0 % and 14.1 %, between 0 % and 18.9 %, respectively, for 3 enzyme activities. The linearity of each enzyme activity was good (R^2=0.9952, 0.9982, 0.9974, respectively). The lower limit of detection was 0.22 umol/h/L, 0.39 umol/h/L, 0.79 umol/h/L, respectively. The recovery was 102.65 %, 101.52 %, 103.50 %, respectively. Carryover was 0 %, -0.14 %, 0.39 %, respectively. There was no ion suppression. Data from 376 anonymous newborn DBS showed an approximate bell-shaped distribution of enzymatic activities (median values were 16.02 umol/h/L, 6.61 umol/h/L, 26.82 umol/h/L, respectively).
Conclusions : The performance of triplex tandem mass spectrometry assays for screening of 3 lysosomal storage disorders using dried blood spots was generally acceptable in a Korean population.