

Abstract

American Society for Histocompatibility and Immunogenetics

TITLE: Quantitative donor specific antibody titration enables patient specific risk assessment and longitudinal monitoring

CURRENT CATEGORY: Clinical Research: Solid Organ

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ABSTRACT BODY:

Aim: Current donor-specific antibody (DSA) assessment relies on single-point, single-antigen bead assays that lack standardization and fail to capture antibody potency or enable reliable longitudinal comparison. We present a quantitative titration-based approach that defines patient-specific DSA potency profiles and translates these into a unified transplant risk score.

Methods: Using biotinylated soluble HLA, mismatched donor antigens are evaluated through calibrated serial titration to generate dose–response curves for individual DSA/allele combinations. Key parameters, including half-maximal effective concentration (EC50) and asymptotic binding levels, are derived to establish a patient-specific potency baseline. Results are visualized as two-dimensional landscapes representing DSA strength and breadth across HLA specificities. Standardized assay conditions enable direct comparison across time points. A composite risk score is generated by integrating quantitative potency parameters across all detected DSAs.

Results: Analysis of a broad panel of clinical samples demonstrates that titration-derived parameters resolve limitations of conventional single-point measurements. EC50 values differentiate high-potency DSAs from low-affinity or clinically less relevant reactivities, while asymptotic responses capture maximal binding capacity independent of signal saturation. Two-dimensional landscapes reveal distinct patient-specific antibody signatures and enable clear visualization of changes over time. Longitudinal monitoring under consistent calibration conditions identifies dynamic shifts in DSA potency that are not detectable by conventional methods. Integration of these parameters into a unified risk score provides a continuous metric that reflects cumulative alloimmune burden and supports stratification of patients based on immunologic risk.

Conclusion: Quantitative DSA titration establishes a standardized, biologically meaningful framework for assessing antibody potency and dynamics. By converting dose–response relationships into patient-specific profiles and a unified risk score, this approach enables improved risk stratification and longitudinal monitoring. This methodology addresses critical limitations of current testing and provides a scalable foundation for data-driven clinical decision-making in transplantation.



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