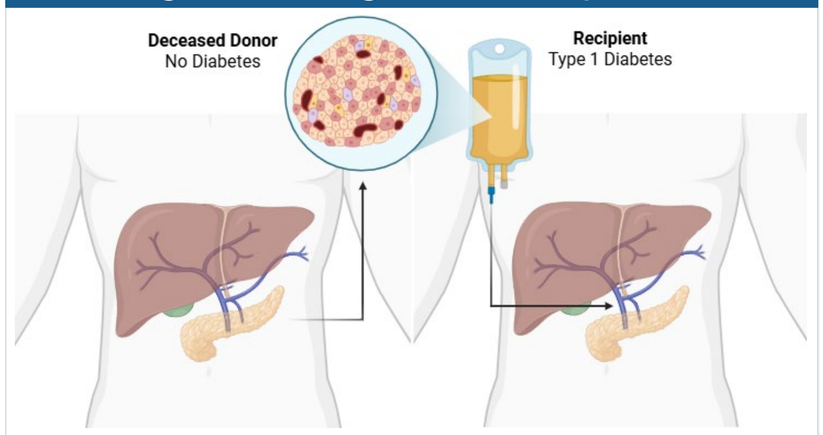
Health Beyond Research and Innovation Showcase 2026 | Poster Presentation | REF: SWD26/086988

Dynamic Multi-Omic Biomarkers for Early Prediction and Therapeutic Stratification in Type 1 Diabetes

Riley W. Hayward; Mugdha V. Joglekar; Wilson K.M. Wong; Anandwardhan A. Hardikar | Diabetes and Islet Biology Group, School of Medicine, Western Sydney University

Predict Earlier | Stratify Therapy | Validate Mechanisms

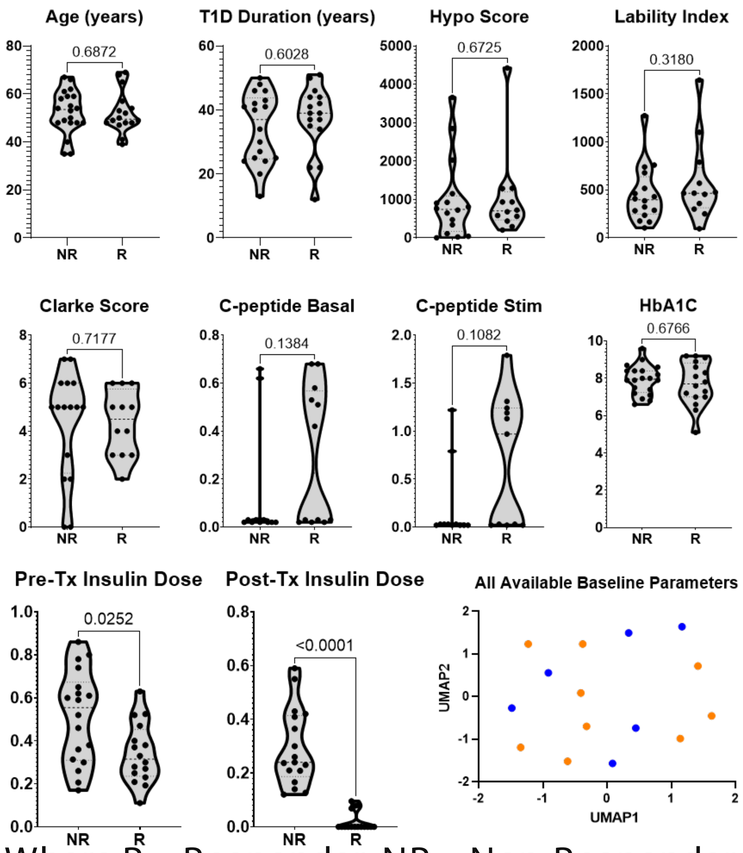
1. Biological setting: islet transplantation



Islet transplantation (Tx) provides a clinically relevant human model of acute beta-cell stress, inflammatory reaction and early graft-function prediction.

Initial hours are molecularly informative

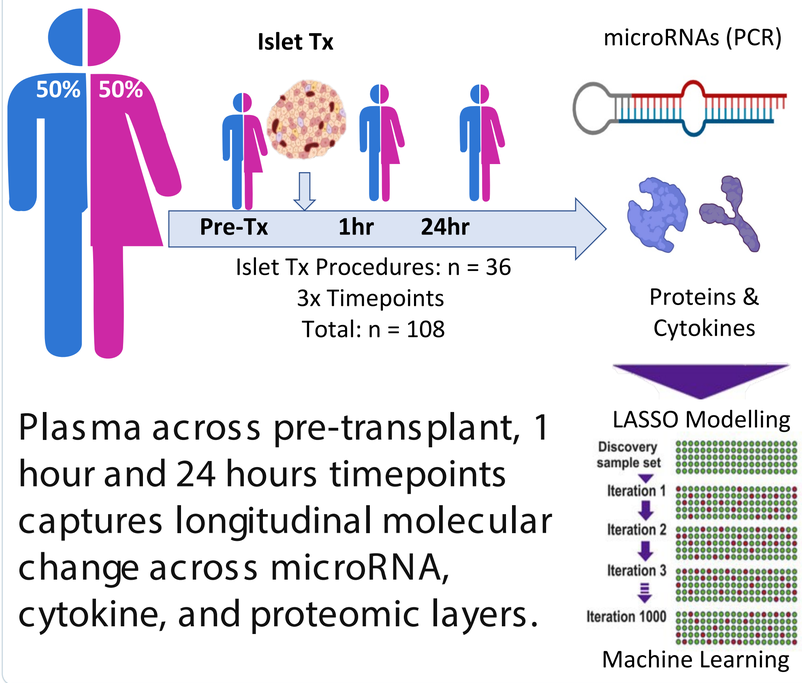
2. Clinical Characteristics



Where R = Responder, NR = Non-Responder

Do not stratify response to Islet Tx

3. Cohort and sampling design



Plasma across pre-transplant, 1 hour and 24 hours timepoints captures longitudinal molecular change across microRNA, cytokine, and proteomic layers.

4. microRNA signal at 1 hour Post-Tx

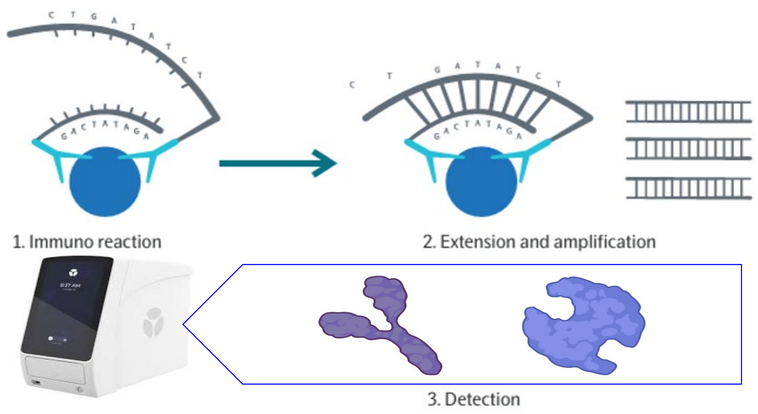
eDRS4C performance (n=25-31 individuals)	Pre-Tx (n=31)	1h Post-Tx (n=25)	24h Post-Tx (n=29)
AUC	0.444	**0.820**	0.714
Recall (Sensitivity)	0.333	**0.600**	0.800
Precision (PPV)	0.545	**0.900**	0.632
Accuracy	0.452	**0.720**	0.655
F1 Score	0.414	**0.720**	0.706
Kappa	-0.048	**0.462**	0.303
Specificity	0.615	**0.900**	0.500
Neg Pred Value	0.400	**0.600**	0.700

Joglekar MV, et al. Nature Medicine, 2025

Machine-learning-derived microRNA signatures indicate 1 hour Post-Tx as the earliest tested time for early prediction of insulin production and graft outcome.

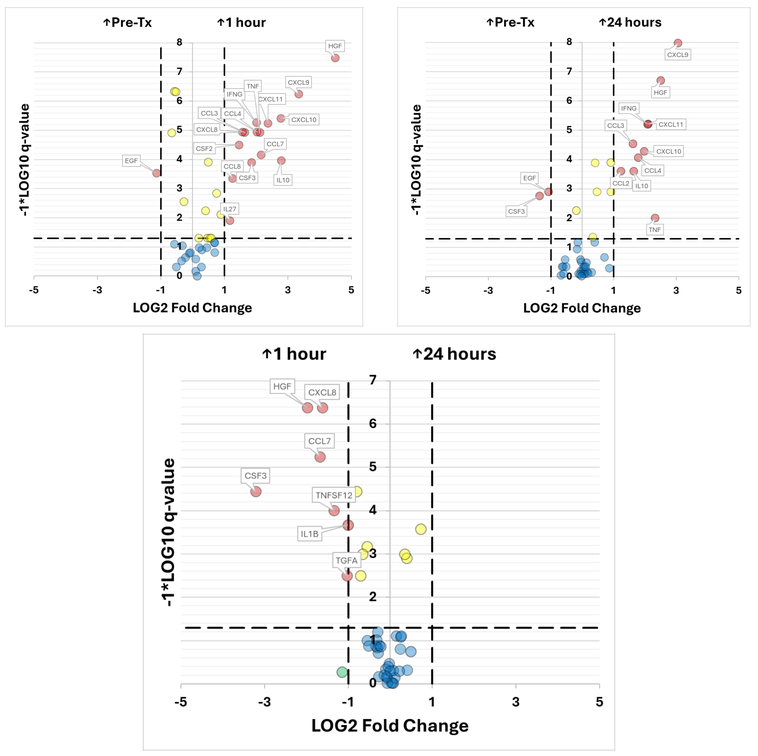
1 hr Post-Tx = key prediction window

5. Targeted proteomics workflow - Olink



Olink panels use proximity extension assay chemistry to detect cytokine/protein abundance in low volumes of plasma/serum samples.

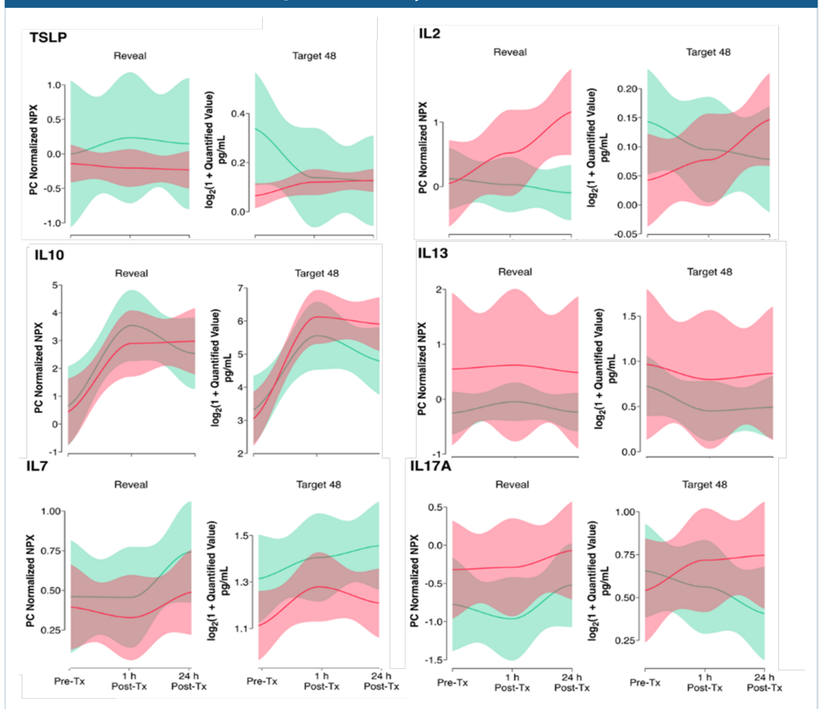
6. Cytokine Response



Volcano plots show a strong 1 hour inflammatory signal, followed by a shifted but persistent 24 hour cytokine profile.

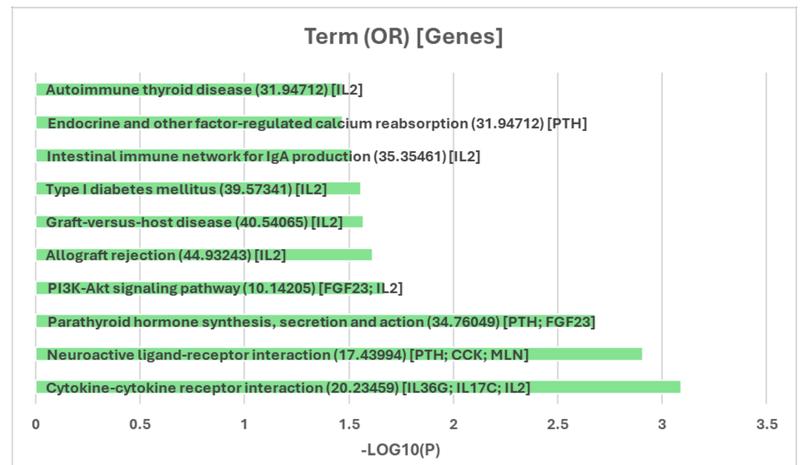
Inflammation before clinical failure

7. Protein Temporal Dynamics



Smoothened curve plots stratified by response across Olink platforms

8. Pathways behind the signal



Top 10 KEGG pathways enriched among proteins identified by LASSO analysis. Pathway enrichment based on protein predictors from 1 hour and 24 hours timepoints present in ≥28% of bootstrap iterations. Odds Ratios (OR) reflect strength of enrichment, while [Genes of the proteins contributing to pathway enrichment].

Multiple omic layers, one signature

9. Translation

Molecular change
microRNA | cytokines | proteins

↓

Mechanism
islet stress | inflammation | beta-cell loss

↓

Clinical action
risk prediction | therapeutic stratification

Final message: dynamic biomarkers can turn molecular signals into earlier clinical decisions.

10. Acknowledgements

This research was supported by the Commonwealth through an Australian Government Research Training Program Scholarship [DOI: https://doi.org/10.82133/C42F-K220].

JOGLEKAR, M. V., KAUR, S., POCIOT, F. & HARDIKAR, A. A. 2024. Prediction of progression to type 1 diabetes with dynamic biomarkers and risk scores. Lancet Diabetes Endocrinol, 12, 483-492.
JOGLEKAR, M. V., WONG, W. K. M., KUNTE, P. S., HARDIKAR, H. P., KULKARNI, R. A., AHMED, I., FARR, R. J., PHAM, N. H. T., COLES, M., KAUR, S., MAYNARD, C. L., HAYWARD, R., THORAT, V., PANT, A., AKIL, A. A., DONAGHUE, K. C., JENKINS, A. J., PIYA, M. K., CRAIG, M. E., HAGUE, W. M., YAJNIK, C. S., CHAN, J. C. N., SHAPIRO, A. M. J., DAVIS, E. A., JONES, T. W., GITELMAN, S. E., MA, R. C. W., POCIOT, F., HARDIKAR, A. A. & GROUP, P. T. D. S. 2025. A microRNA-based dynamic risk score for type 1 diabetes. Nat Med, 31, 2622-2631.

We acknowledge all islet transplant donors and recipients and surgical team at Alberta

Correspondence: A.Hardikar@westernsydney.edu.au | Diabetes and Islet Biology Group | School of Medicine | Faculty of Health | Western Sydney University