The Emory Transplant Center Biorepository

The ETC Biorepository is located within the Woodruff Memorial Building and includes 1200 square feet of dedicated laboratory space for sample processing and analysis, and an additional 800 square feet of secured, dedicated freezer space outfitted with 6 upright -80 freezers, 2 liquid nitrogen freezers and 2 upright -20 freezers. All freezers are linked to 24-hour climate control alarms that notify an on call technician should a temperature anomaly occur. In addition, there are two -20 under counter style freezers and a 35 cubic foot double door 4°C refrigerator for reagent storage. A semi-automated cell counting system is also on hand to ensure accurate cell counts for cells to be cryo-preserved. The Biorepository is the ultimate residence of all blood and tissue samples acquired for the ETC categorized based on established diagnoses, specific immunosuppressive induction regimens, and known immunosuppressive drug levels at the time of blood procurement. All samples are collected either under a common IRB-approved tissue acquisition protocol (Immune Monitoring Protocol, IMP, IRB#6248; ClinicalTrials.gov Identifier: NCT01283295) allowing their use for observational studies, or under protocol-specific IRB-approved protocols directing their use for protocol-specific endeavors. The consent and protocol for which a sample is collected is linked with the sample throughout its processing and tracking through a bar-coded unique identifier (see below). A concerted effort to cross-enroll patients involved in interventional trials and the IMP observational study, when authorized by the interventional trial sponsor, has allowed sample collection from patients in numerous trials that isolate the immunosuppressants by mechanistic class.

Precise samples inventory is facilitated through an ABgene® 2D Barcode system. This system includes the sample tubes themselves, which have a 2D barcode with 14 digit alpha-numeric code implanted on the sample tubes themselves and have no labels that can become dislodged or compromise blinding. There are over a billion alphanumeric combinations, allowing for unique sample identification. A scanner complete with two separate CCD Cameras to ensure accurate reading of barcodes reads the tubes and data are then downloaded into the Laboratory Information Management System (LIMS) for electronic inventory. The scanner is capable of reading either a single 2D Tube or in batches of 48, 96 or 384 tubes such that tubes are scanned into the LIMS system (see below). Samples are stored at -80°C, and then transferred to liquid nitrogen if prolonged storage is anticipated.

We have established a means of reliably associating collected samples with the required data elements (Figure, below). All samples deposited within the Biorepository are characterized with a unique de-identifiable number that is linked to the clinical dataset via a HIPAA-compliant data flow stored on a HIPAA-compliant protected server. Association of samples with clinical parameters (e.g. demographics, drug doses and levels, viral infection labs, biopsy reports) is facilitated by a Laboratory Information Management System (LIMS), and REDCap, an electronic case report form, leveraged against the Emory Clinical Data Warehouse (CDW) and the transplant specific Organ Transplant Tracking Record (OTTR). Discrete data fields are applied seamlessly to the sample, while a trained clinical data abstracter enters non-discrete data. Each clinical record involving a pathological diagnosis is reviewed with an attending clinician to verify the ultimate clinical phenotype. Samples are stored based on clinical category, allowing investigators to withdraw samples based on diagnosis in much the same that a person would withdraw a book from a library. Aliquots are individually tracked based on the barcode embedded in the storage vial and availability of a particular sample is registered in real time. Placing a particular samples on hold accommodates specific investigator needs for future dedicated use. All data are link through the LIMS, so that patient identifiers can be released based on the appropriate level of authorization ranging from anonymization to de-identification to full clinical data access.

An Integrated Research Support Service (IRSS) serving the entire transplant enterprise supports the Biorepository. It allows for enrollment of properly screened patients, data capture, and the acquisition of well characterized biological samples. A staff of 9 research nurse/coordinators actuates sample acquisition and 6 research laboratory staff members support sample processing. Coordinators and research staff are co-located and cross-trained to facilitate universal trial coverage, reduce individual call burden, and facilitate dedicated administrative support. All new transplant patients are offered enrollment into the IMP for longitudinal study, and returning patients with specific suspected complications requiring diagnostic biopsy are also offered enrollment. Through the efforts of the IRSS, our current screening rate is 93.2% of patients presenting for transplantation, and our current enrollment rate is 75.2%. Since its implementation, the IRSS has in three years supported 19 clinical trials and 4 multicenter studies, enrolling over 1500 patients in the IMP, and processing over 85,000 biological aliquots.

![Flowchart of sample tracking and data management](image-url)