Building a Better Biorepository
The path toward repository management optimization
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BACKGROUND
• Accurate management of sample characteristics is critical to biorepository management
• Sample management software, such as Freezerworks, offers a flexible solution for labs to track their inventories

Various factors, including differences in software proficiency, changes in technologies and the complexity of study-specific protocols, leads to an increased likelihood of database inaccuracies and necessitates regular review and QC

BSRI BIOREPOSITORY (FREEZER FARM)
• 3164 sq. ft. freezer room storing 1 million+ samples
• 75+ mechanical freezers and 10 liquid nitrogen storage tanks
• Repositories for multiple immunology, virology, cellular therapeutics, epidemiology and health policy research programs
• Various specimen types, including blood components (RBCs, plasma, serum, PBMCs), urine, semen, saliva and stool
• 24/7 live temperature monitoring with immediate response capacity
• BSRI has used Freezerworks as its primary sample management system for almost 25 years

SOFTWARE BENEFITS
• Standardized data entry templates facilitate consistent sample tracking
• Ability to quickly run customizable searches leads to faster turnaround times
• Flexible and configurable database setup allows for adaptation to the specific needs of different labs and studies
• Integration with Excel, barcode scanners and label printers streamlines workflows
• Automated audit trail guarantees true historical tracking of database activity
• Reliable support from Dataworks Development staff makes easy resolution of issues and questions

CHALLENGES
• Unfamiliarity with the software and inadequate training of end users leads to mistakes
• Study protocol differences and complexity makes data entry confusing and inconsistent
• Manually entered data is prone to human error (i.e. inversion of digits in an ID, misspelling of a sample type, etc.), which could result in failed searches
• Accumulation of unchecked errors negates the effectiveness of the software to accurately track long-term specimen inventories
• Allowing end users unlimited control of a highly flexible and configurable database leads to issues
• Software upgrades require validation of data migration, staff retraining and evaluation of current sample management workflows

REMEDIATION
• Establish clearly written data management SOPs and conduct regular training/re-training
• Streamline data entry by shifting away from single Sample Entry screens and more towards Batch Entry and Imports
• Clean up existing data with input from developers and users
• Conduct regular QC of the virtual and physical repository
• Limit more powerful database functions (such as delete) to administrators
• Attend Dataworks-hosted events to keep up-to-date with current software and use

CONCLUSIONS
Standardization and proper training of sample management procedures is important to ensure database integrity
Ongoing QC is critical to controlling for downstream issues
Careful control of end user permissions reduces the likelihood of critical mistakes due to improper/inadequate training
Regular evaluation and revision of procedures is necessary to optimize workflows and adapt to changes in technologies and studies

FUTURE DIRECTIONS
• Utilize Label, Shipping and Testing modules to consolidate workflow within a single program and migrate towards using Freezerworks as a LIMS
• Increase usage of 2D barcoded Matrix tubes and flattened barcode reader to streamline QC
• Utilize macros and automation to reduce human error and generate Freezerworks-ready Excel files
• Apply new features of Freezerworks 2017
  • Workflows – increase standardization of multi-step processes
  • User Roles – easily define user permissions by function
  • Protocol Management – pre-configure study-specific details, such as visits and associated samples
• Communicate regularly with other users to receive input and feedback on database use

Figure 1. The Dr. Leslie Tobler Biorepository (Freezer Farm) at BSRI.

Figure 2. Sample Management Workflow. Typical operational workflow of the BSRI Viral Reference Laboratory and Repository Core (VRLRC) heavily relies on Freezerworks to accurately track the migration of samples.