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A Robust and Cost-Effective Alternative to LIMS for Sample Data Management

Scientists recognize the importance of retaining critical research information that includes not only the raw data and accompanying analysis, but also information regarding the samples used to generate the data and their physical location in the laboratory. It is critical to implement a sample management system that is accessible, easy-to-use, expandable, and affordable. Ideally, the system should also be centralized and comprehensive in its ability to store different types of information, be adaptable to the changing needs of the scientist, and have the ability to be easily integrated into existing systems.¹

In the past, sample management was typically accomplished by paper-based notebooks or spreadsheets maintained on a single-user computer in the laboratory with accompanying raw data files and images cut and pasted into separate laboratory notebooks or binders.² Currently, the number of samples being collected and processed is growing rapidly in response to the rapid technological advances occurring in life science research and diagnostics. As a result, it has become obvious that an efficient integrated sample management system is of vital importance to maximize resources and productivity and also to preserve these data in a robust format.³

Scientific organizations have recognized the importance of harmonizing their data management and storage systems and are actively seeking ways to standardize these systems to eliminate wasted effort, streamline data entry and retrieval, and secure data archival. Oftentimes, departments within the same organization will utilize incompatible sample management systems from different vendors for redundant

purposes.⁴ This increases costs, reduces efficiency, and restricts communication within the organization.

Current options

It is difficult for a laboratory to implement a robust sample data management system even for a modest collection of samples. This is true for all research organizations, including industry, academic, nonprofit, and government institutions. There is a need for an affordable sample management system that can easily integrate different data sources electronically, while also pro-

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viding a user-friendly interface for easy data entry, retrieval, and export. Companies have invested countless hours and resources hiring programmers to build custom sample management systems. While these custom-designed systems have worked to help alleviate some of the logistical problems associated with managing large sample collections, the systems themselves are often difficult and inefficient to use and maintain and cannot be easily adapted to changing needs.⁵ Smaller laboratories and organizations certainly do not have the resources to devote to creating customizable databases.

LIMS is one solution large corporations have elected to use for sample management because of their ability to allow users from multisite production environments to transfer and share quality data throughout the organization. Implementation of a LIMS within organizations has demonstrated success in terms of streamlining and focusing enterprise resources. Unfortunately, this comes with a large cost in regard to dollars and resources; LIMS are expensive to purchase and difficult to implement and maintain.

Software solution

Solutions for storing and managing biological samples at room temperature have been developed by **Biomatrix**[®] (San Diego, CA). **SampleWare**[®] V 3.0 is an easy-to-use software program for sample management and organization. It allows a user to store and track sample data with ease. The data are maintained in a hierarchical structure that can map sample data to their physical location in the laboratory, allowing samples to be located and retrieved efficiently. Sample data are stored within "containers" that are organized through a directory tree (see *Figure 1*). Sample data are described by user-defined data templates. This customization permits the structure of the sample data to match the actual sample types stored in the laboratory.

Operation

SampleWare is an easy and efficient way to harmonize a laboratory's sample storage system with an innovative software platform with tools for uploading, tracking, and receiving sample data effectively. The system permits users to employ bar-code or radiofrequency identification (RFID) tags to track their samples and identify their physical loca-

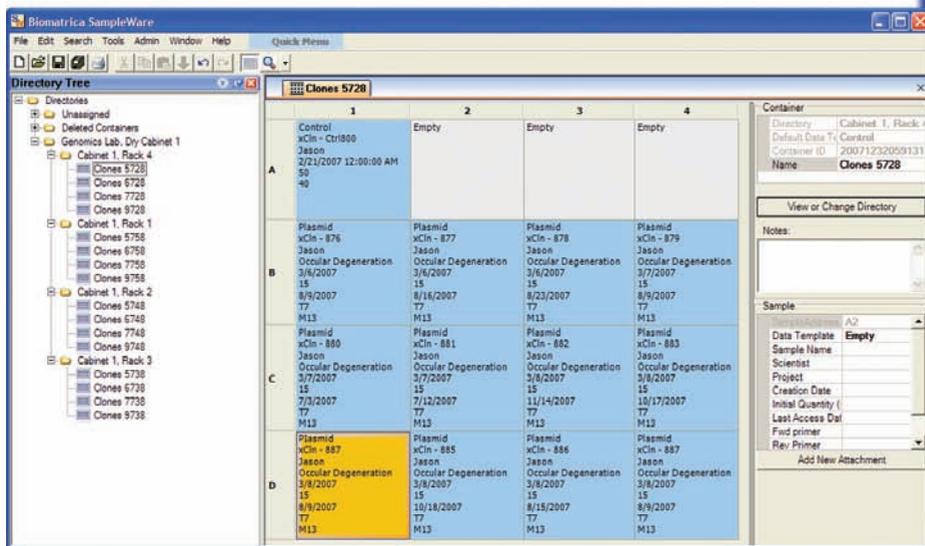


Figure 1 Data are organized to reflect the physical location of the sample.

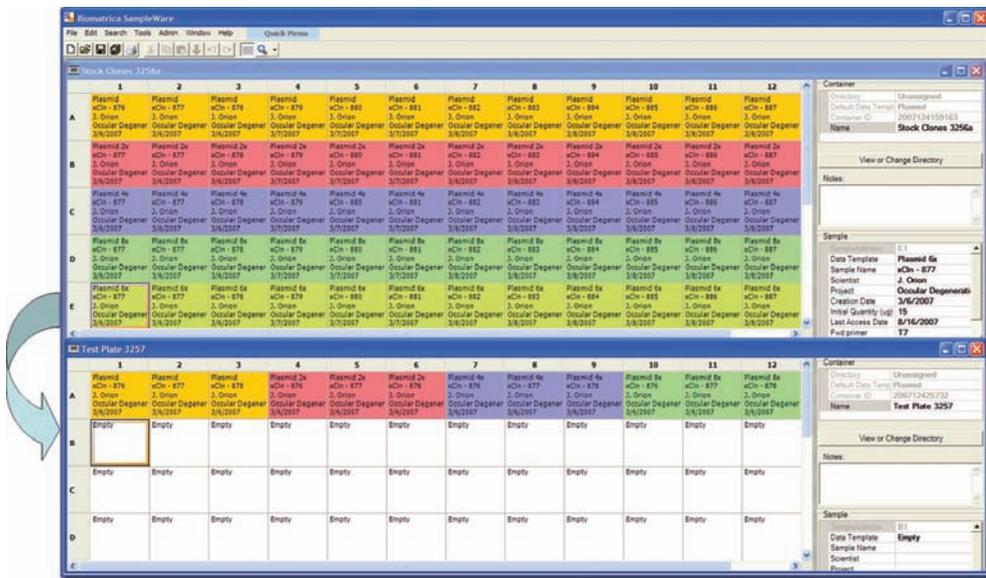


Figure 2 Samples can be transferred between containers.

tion in the laboratory. The system is customizable, allowing users to add samples to the database and customize the type of information stored for specific sample types. The powerful search engine within the software program enables users to quickly search for and locate any sample stored in the database. The software directly supports samples stabilized by RNAsable™, CrudE Sample-Matrix®, and QIA safe™ (all available from Biomatrix; QIA safe distributed by QIAGEN® [Valencia, CA]).

SampleWare permits laboratory managers to import sample data into the system,

copy from sample files within the systems, and transfer physical samples along with their corresponding data between departments. The methods for data entry and sample management include an easy-to-use spreadsheet that can be exported to Microsoft® Excel™ (Redmond, WA) and a boxtop view that provides a realistic representation of sample data.

Features and benefits

Samples can be transferred and copied while viewing multiple containers, enabling the user to build test plates, assemble data from multiple contain-

ers, and efficiently track sample movement (see Figure 2). SampleWare provides several methods for data entry and management including an easy-to-use spreadsheet where search results can be exported directly into Excel. The program also makes use of bar-code or RFID labels to automatically identify samples, such as those from the manufacturer's current product line. Images and data files can be stored directly with individual samples.

The SampleWare laboratory software system is offered in three editions: Desktop, Network, and Basic, depending on the size and scale of the laboratory. SampleWare Desktop edition is a single-user version with unlimited storage capacity. SampleWare Network edition allows for multi-user functionality with the purchase of additional network licenses as needed. SampleWare Basic is a single-user version limited to the storage of 5000 samples.

The SampleWare Basic and Desktop versions use a Microsoft Access database (.mdb) located on the machine. The Network version includes an MSDE SQL database that enables sample data to be accessed across the network. Custom platforms can be developed to link the SampleWare program with other servers and databases so that information can be shared easily. The current Sample-

Ware software program is a Windows-based program and is accessible with any version of Windows. The system is also upgradeable without the loss of information from one version to the next.

SampleWare is easy to install and is supplied with an installation wizard to guide the user or administrator through the process. Once the users are configured, the directory tree is structured and the data templates are configured so that the system is ready to use within minutes. The SampleWare database can be customized with minimal effort

to suit the specific needs of an individual user or laboratory.

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