

Establishing a Publicly Accessible Compound Repository to Stimulate Drug Discovery in Australia

D. Camp¹, I. Yates², B. Schenker³, E. Williams⁴, R. J. Quinn¹, J. Sanghera³ and S. Fillers⁴

¹ Eskitis Institute for Cell and Molecular Therapies, Griffith University, Brisbane, QLD, 4111, Australia.

² Velocity11, 3565 Haven Ave, Menlo Park, CA 94025 USA.

³ TTP LabTech Ltd, Melbourn Science Park, Melbourn, Royston, Herts SG8 6EE United Kingdom.

⁴ TekCel, 103 South Street, Hopkinton, MA 01748 USA.

Introduction

The Eskitis Institute of Cell and Molecular Therapies, Griffith University is a multidisciplinary research institute that pursues a number of different programs in basic, applied and translational research. The programs are underpinned by well-equipped facilities that include HTS, HCS, high throughput cell culturing, FT-MS, NMR, Structural Biology, and now the Queensland Compound Library (QCL). The QCL was financed by the Queensland Government's Smart State Research Facilities Fund and Griffith University.

The guiding principle of the QCL is to facilitate collaboration between Australasian chemists and biologists, and add value to the already excellent basic medical research, synthetic organic chemistry and natural product expertise in the region. Chemists can deposit compounds into a central repository thereby allowing biologists access to a unique suite of molecules in screen ready microtitre plates.

Of great importance is the fact that the QCL does not lay claim to any intellectual property owned or generated by users of the facility. A unique IP model that lies somewhere between the propriety culture in industry and the NIH's policy of placing data in the public domain was developed for the current Australasian situation. The QCL model allows synergies to develop and mature into projects that are prosecuted in a way best suited to the collaboration.

Automation Platform Selection

When choosing an automated platform that will be supporting a large and diverse customer base, careful attention must be taken to ensure the platform meets the needs of customers. The system must:

- Ensure sample integrity and accessibility
- Provide a robust and reliable solution (high uptime)
- Have the appropriate capacity and throughput with possible upgrade paths

After an extensive evaluation of the available alternatives, a system configuration composed of three main building blocks was chosen. These chief components will be described along with the features that make certain the above mentioned criteria are met.

TTP LabTech comPOUND – Tube Storage and Retrieval

TTP LabTech's robust comPOUND® sample store holds up to 100,000 microtubes in an inert, dry and dark environment at temperatures down to -20°C. comPOUND is a modular system and multiple stores can be linked in parallel. Sample tubes can be cherry-picked from all linked stores at the same time, allowing throughputs to increase as a library grows. comPOUND's rapid pneumatic delivery system allows tubes to be sent to a compANION remote unit located up to 15m away from the main store – in this case within the envelope of the BioCel.

Requested samples are individually cherry picked from store, so there are no unnecessary thaw cycles, and racks of retrieved tubes can be arrayed in user-specified formats to simplify subsequent plate creation. Each tube carries an individual 2D barcode which is read on the way into and out of the store, so it is impossible to obtain the wrong sample.



This system is currently being assembled and is due to be delivered in Q4 2007 to coincide with the completion of a dedicated facility.

Velocity11 BioCel – Plate and Tube Sample Processing

The Velocity11 BioCel® has a proven track record in the field of compound handling. The use of high-quality devices of placed around a very high-speed 3-axis radial robot allows for rapid and secure processing of the tube racks and plates supplied from the storage units. Two VPrep® Precision Liquid Handlers allow for simultaneous processing of both septum-sealed tubes and microtitre plates. A Labcyte Echo550® acoustic dispenser provides non-contact, very low volume dispensing capability. To complement the environmental control in the storage units the BioCel is equipped with inert gas shelves on the liquid handler and a PlateLoc® thermal plate sealer with integrated inert gas purging to allow plates to be sealed with a protective inert gas layer. Other equipment on the BioCel includes a VSpin® centrifuge, VCode® print and apply station, VStack® labware stackers and 1D and 2D barcode scanners.

TekCel ASM – Plate Storage and Retrieval

The Active Sample Manager, or ASM, from TekCel is a compact, modular, localized-storage system for secure compound management. The ASM delivers huge advantages in flexibility, speed, throughput, ease of use and security of samples and is available in various configurations to meet a laboratory's demands.

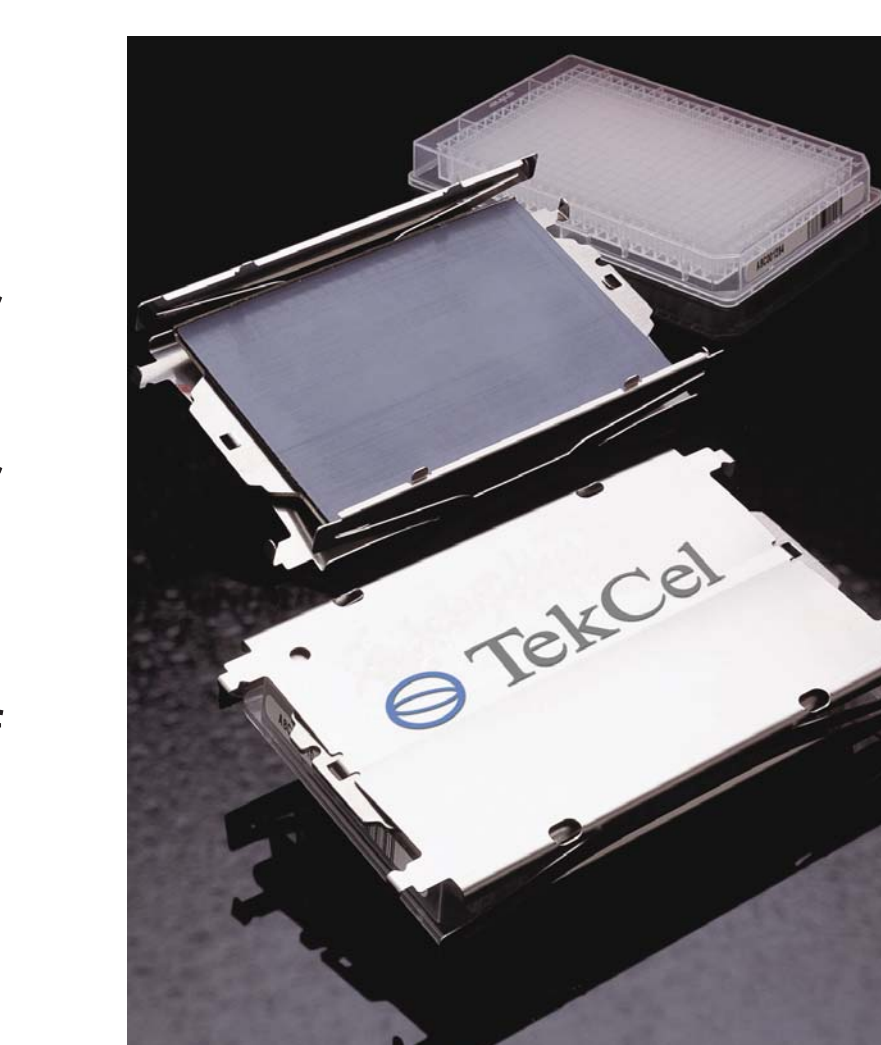
The ASM with serverST is TekCel's latest addition to the ASM product line. Configured with the serverST the ASM provides storage capacity for up to 2,200 microplates with SealTite seals, the worlds first reusable microplate seal designed for automation.

The ASM provides a controlled environment between ambient (room) temperature conditions and -20°C. It also provides the option of an inert gas environment to maintain a very low humidity within the storage environment. These environmental options offer optimum conditions for compound storage to help ensure sample integrity.

TekCel's ASM delivers plates at a high-throughput rate of up to 120 plates per hour. The serverST can then unseal and deliver the picked plates via a handoff arm directly into the work area of a third party device (such as the Biocel) for processing.

SealTite facilitates fully automated and repeated sealing and unsealing of microplates, with no heat and adhesives to contaminate compounds in storage. SealTite is manufactured from stainless steel with a 100% DMSO-compatible inner liner that conforms to the shape of the microplate wells.

Together, TekCel's ASM and SealTite provide an ideal laboratory-scaled solution for the management and delivery of microplates for active compound storage.



Conclusion

The establishment of the Queensland Compound Library will be a valuable tool in stimulating drug discovery in Australia. The combination of a unique IP model, a pre-existing, successful infrastructure and a fully integrated compound handling system will create a very effective mechanism for facilitating collaborations between different groups of scientists.

The integration of environmentally controlled plate and tube storage with sample processing ensures that compound integrity is maintained without compromising flexibility. The modular approach allows future capacity building and throughput increases to be realised with minimal disruption to on-going operations.

The delivery of this sophisticated compound repository and management facility required a number of novel approaches to project management, install and post-delivery support. The commitment from all parties to address the challenges presented by the distributed geographical location of the four entities involved has laid the foundation for successful provision of a compound logistics service that can operate at world's best practice.

