High-Throughput Screening: Best Practice, Trends and Challenges

High-throughput screening (HTS) has developed into a hugely important and valuable area for the pharmaceutical industry, particularly in the field of drug discovery.

The method has the potential to reap substantial benefits for the sector in the years to come, provided it receives the necessary support and is helped to grow through efficient practice.

$19.9bn by 2017?

Market research firm Global Industry Analysts published a report in June 2011 predicting that the worldwide market for HTS could reach a value of $19.9 billion (£13.2 billion) by 2017.

The approach already accounts for well over a third of the global drug discovery technologies market, according to the study, with several developments in recent years supporting its growth.

Significant technological advancements in the genomics and proteomics research fields boosted the potential of HTS solutions, while the scope of the method was widened by the increasing use of tools such as protein arrays and DNA microarrays.

The rising number of potential drug targets for screening will drive growth in HTS in the years to come, according to Global Industry Analysts.

Furthermore, stiff competition between pharmaceutical companies vying to be the first to market a new product will also ensure the expansion of HTS, as one of the big advantages of the process is a reduction in the amount of time required to get drugs onto the market.

Looking at the long-term picture, Global Industry Analysts said an ongoing focus on technology upgrades and improved funding and adoption of the method by governments and research institutions will help its future progress.

Practices and Challenges

According to an article published in the Nature Chemical Biology journal, small-molecule HTS can only continue to grow in the most effective and efficient way if providers and users of chemical libraries adopt quality and reporting standards.

The journal pointed out that academic access to the method has improved in the past decade, as the availability of compound libraries has increased and the range of institutional and publically funded screening centres has broadened.

Consequently, more scientists have used HTS to identify chemical probes and drug leads for biological targets.

However, the less desirable outcome of the growth has been the exposure of limitations and potential pitfalls in the technology.

"To ensure that chemical library screening continues its upward trajectory, the community must establish universal standards for chemical libraries and 'best practices' for reporting the results of high-throughput chemical screening experiments," Nature Chemical Biology argued.

The journal urged library creators to enforce tighter quality control standards to guarantee the integrity of their information.

Users of libraries were encouraged to be proactive in their HTS work and to specifically validate the chemical identities of their screening hits.

Another concern related to the ongoing development of HTS is the automation of the method.

In an article published in Drug Discovery & Development magazine, contributing editor Mike May stressed that, in order to fully automate the process, researchers require a combination of hardware and software.

"Robotic arms and liquid-handling systems bring improvements to these processes, but keeping such complicated workflows efficient requires software tools that track the processes and samples," May wrote.

"In addition, some companies make modular systems that let users expand the automation of a system over time."

Matt Kirtley, product manager at Agilent, a manufacturer of electronic measurement instruments, explained that HTS systems normally consist of many pieces, so automation of the practice requires a more modular approach.

Researchers are also increasingly looking for flexible systems that can be repurposed for various projects, Kirtley said.

Another potential goal on the technological side of HTS is integrating different tasks to increase efficiency.

Keeley Murphy, pharmaceutical marketing specialist at Thermo Fisher Scientific, said it makes no sense to collect 1,000 samples in a day if they cannot be analysed, underlining the value of an all-encompassing workflow to collect, process and manage data.
