

New Tools for the LifeScience Industry - From Systems Biology to Microtechnology

Computer simulations combined with assay technologies and microtechnology based manufacturing reduce time-to-market significantly.

Microtechnology and Systems Biology form a significant basis for research and development performance by enhancing efficiency, reducing capital and human resources required, containing risks by shifting them to earlier developmental phases.

Charts 1-9

Bayer Technology Services (BTS) has actively pursued and implemented technologies to help shorten the development time from discovering the target to the approval of new active substances by using a Systems Biology approach. One of the most advanced assay technologies based on planar wave guide detection systems from Zeptosens, one of the latest acquisitions by BTS, generates the necessary data to address even difficult biological questions. The large amount of data involved requires sophisticated computational methods for the understanding and simulation of complex biological systems (biomarker identification, drug action, adverse effects detection, pharmaco-kinetic-simulation (pk-Sim®)).

Applications of new in-silico methods (Data Mining and Systems Biology) combined with assay technologies in a variety of projects (pharmaco-kinetic-simulation of drug performance with children, biomarker identification and application for breast cancer and cytostatics simulation for cancer cells) will be discussed demonstrating the potential benefit of new in-silico methods and assay technologies.

Charts 10-15

Equally important are new tools in the manufacturing of active substances that improve speed and flexibility during drug synthesis, since time to market is decisive for all phases of the development of active compounds. Selected synthesis pathways and early product specifications define options for clinical developments or field trials and future manufacturing. Process scale-up and facilities to provide materials for clinical tests or field trials add significant expenses during development. The overall plant concept affects capital investment, flexibility and cost of goods.

Furthermore, the supply of high-value, low quantity medical polymers and materials will require new, flexible and modular manufacturing concepts supplementing the world-scale approach for bulk materials.

Microtechnology influences manufacturing of active materials and medical materials in various aspects: by using a variety of modules, sensors and actors process development is accelerated, safety issues can be solved more easily, scale-up issues are avoided, the flexibility is improved and new products are possible: in consequence this leads to better products with an overall reduction in time and investment.

In addition, a Microtechnology based modular manufacturing concept for active ingredients enables selecting the best synthesis route very early, to minimize problems during process development and to flexible adapt capacities to the actual product demand during the product life cycle.

Charts 16-21

The LifeScience Industry (Pharmaceuticals, CropScience, Medical Devices and Materials) faces increasing challenges due to long development cycles, rising complexity, uncontrolled failure risks, growing competition from small, innovative start-ups and regulatory requirements. These trends lead to exploding cost developing new drugs and medical systems.

For these reasons new concepts to discovery, development and manufacturing of drugs, agricultural products and medical materials are desirable that efficiently create data and information, improve information handling, enhance decision-making and transfer failure risks into earlier development phases minimizing the resources required.

Bayer Technology Services (BTS) supports the Bayer Group (BHC, BCS and BMS) by developing, maintaining and applying innovative technology platforms such as Microtechnology and Systems Biology to the technological challenges of Bayer. BTS has a longstanding experience with the modeling and simulation of complex, dynamic technical systems similar to Systems Biology.

Charts 22-24