



CUSTOMER CASE STUDY:

HUNT Biobank Implements Thermo Scientific Nautilus LIMS™ to Manage Medical Data

The Nord-Trøndelag Health Study (HUNT) is one of the largest population-based health studies ever performed. Spanning almost 25 years, HUNT now represents an integrated family and personal database of approximately 100,000 people from Nord-Trøndelag County, Norway. Initiated to support epidemiological, clinical and preventative medical research, HUNT offers a valuable insight into disease status and progression, particularly in relation to quality of life measures such as environment, education and occupation. To accommodate for the vast scope of this project, a comprehensive Laboratory Information Management System (LIMS) is required to gather, store, manage, track and retrieve material securely, and be capable of yielding real-time, dependable analysis and reports.

Profile

The HUNT Research Center is part of the Faculty of Medicine at the Norwegian University of Science and Technology, situated in Verdal, Nord-Trøndelag County. Between 1984 and 1986, the first population-based health study (HUNT 1) was initiated in the County to establish the health history of 75,000 participants aged 20 or older. The HUNT 1 project was primarily designed to identify the prevalence of hypertension, diabetes and lung disorders, as well as the healthcare provided to persons suffering from these diseases. Following consent, partici-

pants had their blood pressure, height and weight measured, chest x-rays were taken and individuals were asked to complete two questionnaires. Today, this database is a valuable source of epidemiological research in cardiovascular disease, diabetes and quality of life.

The HUNT 2 project was the follow-up study performed between 1995 and 1997 to study the evolution of the health histories of 74,000 individuals. Repeat examinations and follow-up of the same population made it possible to observe trends and changes in health status at both individual and family

levels. Blood samples were taken from 65,000 individuals and after initial analysis both serum and full-blood samples were stored at -80°C. Samples were organized in a biobank database containing genetic information.

In October 2006, researchers launched HUNT 3, the most ambitious HUNT study to date, which is due for completion in June 2008. 110,000 individuals were invited to participate in the study and data were collected by means of questionnaires, clinical examinations and collection of blood and urine samples. HUNT 3 incorporates over 130 sub-studies, including status in subjective



health, diabetes, lung, cardiovascular, thyroid, muscle and skeletal diseases, mental diseases, prostate complaints, urinary incontinence, female reproductive disorders and gynecological diseases. Participants also provided information on environmental factors such as residence, size of household, education, occupation and personal habits relating to food, drug and alcohol intake, as well as physical activities.

Requirements

In 2005, following a thorough market research effort, HUNT Biobank selected Thermo Scientific Nautilus LIMS to collate, store and administer the huge amount of data from the study. Prior to this implementation, the biobank database consisted of different types of files, such as Excel spreadsheets, csv (comma separated value), texts, etc., requiring long hours of manual capture, calculation and verification of data and considerably jeopardizing data integrity, searchability and accessibility.

HUNT Biobank required a LIMS to ensure that, before embarking on HUNT 3, robust systems for data management were in place. The previous experience from HUNTS 1 and 2 meant that HUNT Biobank required an accessible, searchable system to manage HUNT 3 samples. With anticipated volumes of 5000 samples per week, HUNT Biobank needed a LIMS capable of delivering speed, efficiency and simplicity in one system.

In addition to building a new biobank for HUNT 3, the team at HUNT Biobank believed that a new LIMS would allow them to put in place more professional

systems, and this was particularly important as they were hoping to gain the national biobank status for Norway.

Biobanks worldwide have progressively extended their studies in the last decade, and HUNT Biobank also decided to look at the work other biobanks were doing to manage data. Thor Gunnar Steinsli, LIMS Manager of HUNT Research Centre and Biobank, explains “As HUNT Biobank prepared to embark on HUNT 3, we worked closely with UK Biobank in Manchester who were doing similar studies to HUNT 3. HUNT Biobank signed a general cooperation agreement with UK Biobank in 2005, and one of the areas we found in common was their use of LIMS. UK Biobank also uses Thermo Scientific Nautilus, and we felt that we could benefit from their experiences.”

The Hunt Research Centre and Biobank is highly automated and one requirement for HUNT 3 was to integrate the LIMS directly with the its existing robotics. HUNT Biobank has RTS AssayStation, a fully automatic fractionation robotics instrument from RTS and a TECAN robotics instrument with plate scanner. Integration with these existing robotics is critical for the LIMS because the automatic integration between the LIMS and the robotics facilitates data management – giving HUNT Biobank the power to receive and return results quickly and efficiently.

Additionally, Nautilus LIMS has been employed to serve as the means of linking information from the extensive HUNT database to each study participant’s personal identity number as well as to end-point registries, including The Cause of Death Registry, The Cancer Registry, The National Health Insurance Registry, Hospital Registration Registries and the Population Census Registry. In that way, the HUNT studies will become a major data resource for research purposes and health planning in Norway.

Solution

HUNT Biobank uses Nautilus LIMS to handle the blood samples received in the HUNT 3 study. The laboratory receives approximately 800-1000 samples each day, five days a week. Five distinctly categorized blood samples and one urine sample are taken from each participant. In addition, saliva samples are taken from young people aged 13-18, who participate in the ‘YOUTH’ element of HUNT 3, which does not include blood samples. All information associated with HUNT 3 samples is managed by Nautilus LIMS. The system provides clinical follow-up, data handling and quality control following data collection and distributes coded data files to various research groups.

Thermo Scientific Nautilus LIMS was selected for its capability of meeting the unique requirements of dynamic laboratories, such as the one established to house the HUNT Biobank database. Nautilus LIMS offers unmatched flexibility and ease-of-use while increasing automation and throughput of sample analysis for the dynamic laboratory that runs complex plate-based assays. It is also suited for laboratories where ongoing analysis, varying materials and product demands require adaptability.

The entire implementation of the LIMS has been managed by the HUNT Biobank personnel, who purchased the

LIMS from PlantVision SE, a member of Thermo Fisher's Global Partner Alliance in Sweden. Following its selection in 2005, Nautilus was implemented in time for the initiation of HUNT 3 in October 2006. A total of approximately 20 researchers and administrative staff use Nautilus LIMS from two sites - HUNT Biobank Laboratory and HUNT Research Centre.

By deploying Nautilus in HUNT 3, the HUNT Biobank immediately gained traceability previously unavailable on the earlier HUNT 1 and 2 projects. Nautilus immediately enabled HUNT Biobank to apply the Explorer interface to its data couplings, such as between aliquots and parent samples.

One aliquot from each participant is delivered for analyses to the nearby hospital laboratory and the results are returned to each individual participant of HUNT 3 as an overall general status of their health. The HUNT 3 project has had successful participation from the population because every participant receives the feedback reporting their health status – this survey feedback has been possible through the installation of the new LIMS (and was not available on either HUNT 1 or HUNT 2). The integration between the robotics and the LIMS allows these results to be returned quickly and efficiently.

Benefits

The implementation of Nautilus LIMS has set new standards for functionality and efficient use of the HUNT laboratory resources. Being totally configurable, Nautilus LIMS has been very easy to implement right out-of-the-box while offering the added benefit of being fully compatible with Microsoft® Office for maximum ease of use with little or no user training. With equal ease, Nautilus LIMS has delivered superior data capture, integration and automation capabilities, eliminating transcription errors, providing Hunt Biobank with access to both raw and derived data

and lowering the Total Cost of Ownership (TCO) for its LIMS investment. By improving efficiency and data reliability, the system has enabled more informed decisions faster than ever.

With its built-in instrument integration, the system has offered significant productivity gains right from the outset. Full functionality for plate handling and manipulation has been used to track plate movement and genealogy, while standard integration functionality has allowed data to be easily imported without coding from a variety of analytical instruments. Nautilus LIMS has been integrated with both the fractionation and plate scanner robotics that are being used at the HUNT laboratory. This integration has been critical to the success of the HUNT study as it eases data management considerably. Aliquots from each participant are delivered to the nearby hospital laboratory for analyses and the results are subsequently returned to the participants as an overall general health status. The integration between Nautilus LIMS and the lab's existing robotics allows for much more efficient return of these results.

The unique security capability of Nautilus LIMS has allowed HUNT users to keep regulated data separate from unregulated processes. This has ensured the authenticity, integrity and traceability of the laboratory's data.

In terms of data management, Nautilus allows quick and easy login of the samples each morning, allowing the HUNT Biobank team to begin work on samples immediately. Nautilus gives good traceability for HUNT 3, both in terms of data and in terms of operator, providing management information about who is working on any particular part of the project at a given time. Nautilus' familiar GUI (Graphical User Interface) has made Nautilus easily accepted by the operating team. Most importantly, Nautilus has allowed all HUNT 3 data to be searchable and available to the team working either at HUNT Biobank or at HUNT Research Centre, on the same network.





Conclusion

The HUNT scientists aim to extend the use of Nautilus LIMS to handle all data from the two previous health studies while also configuring the system to store samples that could be used for other health surveys initiated in Norway. In summer 2008, HUNT will implement new fully automated freezing robotics, which will be integrated with Nautilus LIMS, allowing the direct integration of new technology into the HUNT Biobank. Following that, it is intended that the two facilities at Hunt Biobank and Hunt Research Centre will be combined.

Doctors and scientists know a lot about how the human body works, but the effects of lifestyle and the environment on the body's functioning make designing preventative treatments without bankrupting the medical system a much more complex problem. The HUNT study is a major project that involves a large number of individuals across the Nord-Trøndelag County in Norway with the goal of answering one of the most pressing questions of the 21st century: how can modern medicine improve our daily lives? In order to achieve this challenging objective, Hunt Biobank has implemented a wide array of technologically innovative solutions, including Thermo Scientific Nautilus LIMS. This deployment has enabled secure storing, efficient management and real-time reporting of data while also ensuring uninterrupted, dependable transmission of information between the HUNT Biobank and the various national health registries. Overall, productivity, throughput and accuracy have increased, all while improving data administration, sample traceability and regulatory compliance.

In Good Company

Here's a sampling of biobanking customers that count on Thermo Scientific LIMS: the Genome Institute of Singapore, Marshfield Clinic, Biobank UK, Duke University, Singapore Tissue Network, Lifeforce® and Cells4Life.

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