

### Background

*It has long been recognised that lifestyle factors, environmental factors and physical mental status all have a significant bearing upon human health, implicating that much of what a person is exposed to throughout their life can impact upon their future wellbeing. The Nord-Trøndelag Health Study (HUNT) is striving to develop a clear picture of human health by undertaking a vast medical research initiative to gain invaluable insight into the major causes of the most common diseases.*

*The study will also strive to determine how better preventative strategies can be developed and will provide an understanding of how modern medicine can improve an individual's health status. To effectively undertake its study, HUNT needed to upgrade its technological capabilities and invest in a data management solution that will enable the organisation to integrate laboratory processes and data to provide the right information at the right time to management and laboratory personnel who need it.*

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### Authors Details:

Thor Gunnar Steinsli,  
Hunt Research Centre and Biobank and  
Doug Holbrook,  
Thermo Fisher Scientific  
marketing.informatics@thermofisher.com  
www.thermo.com/informatics

## Hunt Biobank - One of the Largest Population-Based Health Studies in the World

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.

### Hunt 3:

The HUNT Research Centre 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, participants 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 organised in a biobank database containing genetic information.

In October 2006, researchers launched HUNT 3, the most ambitious HUNT study to date, which was 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

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.

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 jeopardising 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.

### Global Collaboration:

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, explained: "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 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 robots is critical for the LIMS because the automatic integration between the LIMS and the robotics facilitate 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 samples received in the HUNT 3 study. The laboratory receives approximately 800-1000 samples each day, five days a week. Five distinctly categorised 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.

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 all participants in HUNT 3 as an overall general status of their health. The integration between the robotics and the LIMS allows these results to be returned quickly and efficiently.



## Conclusion

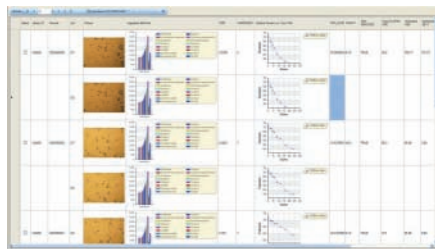
HUNT Biobank is a vivid example of the benefits of integrated solutions and in fact has been recognised recently for a prestigious award from Microsoft – the Pharmaceutical and Life Sciences Innovation Award in Discovery and Product Innovation. Microsoft selected Norway-based Hunt Research Centre and Biobank in recognition of its use of Thermo Scientific Nautilus LIMS to better manage and analyse the large amounts of real-time medical data and provide valuable

insight into disease status and progression.

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 the summer 2008, HUNT was implemented with new fully automated freezing robotics, which was integrated with Nautilus LIMS, allowing the direct integration of new technology into the HUNT Biobank. Following that, it was 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 21<sup>st</sup> 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.

## Enhancing LIMS Information



**Symyx Technologies, Inc** has announced a new release of the Symyx Isestris® decision support system. Isestris 3.2 enables scientists to explore, compare and report on information spanning multiple experiments captured in electronic lab notebooks, the Symyx Lab Execution and Analysis (LEA) software suite, laboratory information management systems (LIMS) and other information management systems.

Symyx Isestris is the cross-experiment data access, analysis and reporting tool for any LIMS system today - driving better informed decisions in scientific experiments and studies. This latest Isestris release supports the ongoing collaboration between Symyx and Thermo Fisher Scientific aimed at integrating Symyx Notebook and Symyx Isestris software with Thermo Scientific's industry-leading LIMS including Watson LIMS used in DMPK/bioanalytical research.

"The Isestris 3.2 release with LEA integration is a significant milestone in the Symyx vision for an integrated electronic laboratory environment, encompassing LIMS capabilities with advanced analytics and reporting for a broad range of applications," said Dr Trevor Heritage, President of Symyx's software business unit. "The cross-experiment analysis and reporting capabilities of Isestris 3.2 significantly increase the value of information captured

within LIMS for researchers working in discovery pharma, in analytical, formulations, and process chemistry - even in agricultural chemistry, chemicals, energy, and consumer goods."

Isestris 3.2 significantly extends the current analysis and reporting capabilities of Symyx LEA software. For many researchers, Microsoft Excel software is the analysis tool of choice. Isestris now enables LEA researchers to easily aggregate data from multiple information sources in a single view and to report on chemical structures, images, chromatograms, spectra and XY datasets, all within the familiar Excel environment.

With the Isestris software developer kit, R&D organisations can extend existing reporting functionality with cross-experiment analysis and reporting, thereby combining additional information sources into analyses and reports on an experiment-by-experiment or study-by-study basis. Scientists can rapidly validate findings by comparing experimental results. They can improve the design of future experiments through comparisons with past experiments and make better decisions by combining information from disparate sources.

Symyx Isestris 3.2 and LEA 8.1 are available now.

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## New Functionality to Streamline the Researcher Workflow

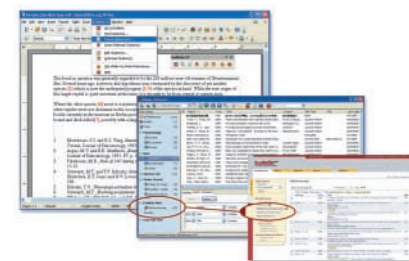
**Adept Scientific** is pleased to announce the release of a major upgrade to EndNote® for Windows, the bibliographic management software used by millions of researchers, librarians and students worldwide, from the Healthcare & Science business of Thomson Reuters. Already a time-saver, EndNote X3, including EndNote Web, delivers a collaborative solution that makes users more productive.

EndNote X3 expands ways to group references and find full text when off campus. EndNote X3 offers more ways to format bibliographies, including the ability to Cite While You Write™ in OpenOffice.org Writer 3. Now users can search for and insert citations within OpenOffice.org Writer documents and format bibliographies instantly, just as they can in Apple® Pages '09 and Microsoft® Word. EndNote X3 now manages multiple bibliographies within a Word document, enabling a paper to have a bibliography at the end of each section, a document, or both. Additionally, EndNote X3 supports composite styles that group citations by number and letter.

Users can organise their Custom and Smart Groups by topic, providing more options for viewing and managing their reference groups. A Group Set can have up to 500 groups per set, and Groups can be re-arranged with a simple drag-and-drop.

EndNote X3 increases integration with institutional resources, making it easier to find more full text articles for references automatically. EndNote X3 employs a new preference for EZProxy, commonly used by researchers and students to access online resources when they are off-campus.

EndNote now includes EndNote Web, expanding the work environment for EndNote users and allowing them to choose the best environment for the task at hand. With EndNote Web researchers can collect references when away from their desks, transfer references between the desktop and Web and collaborate with colleagues by sharing EndNote groups. EndNote users can also use EndNote Web to organise personal publication lists for ResearcherID, a free online author community, and view personal citation metrics in ResearcherID, complete with dynamic links to Times Cited detail from ISI Web of ScienceSM, the Thomson Reuters premiere online platform for citation data.



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