Biobanking clinical cytology samples in Sweden

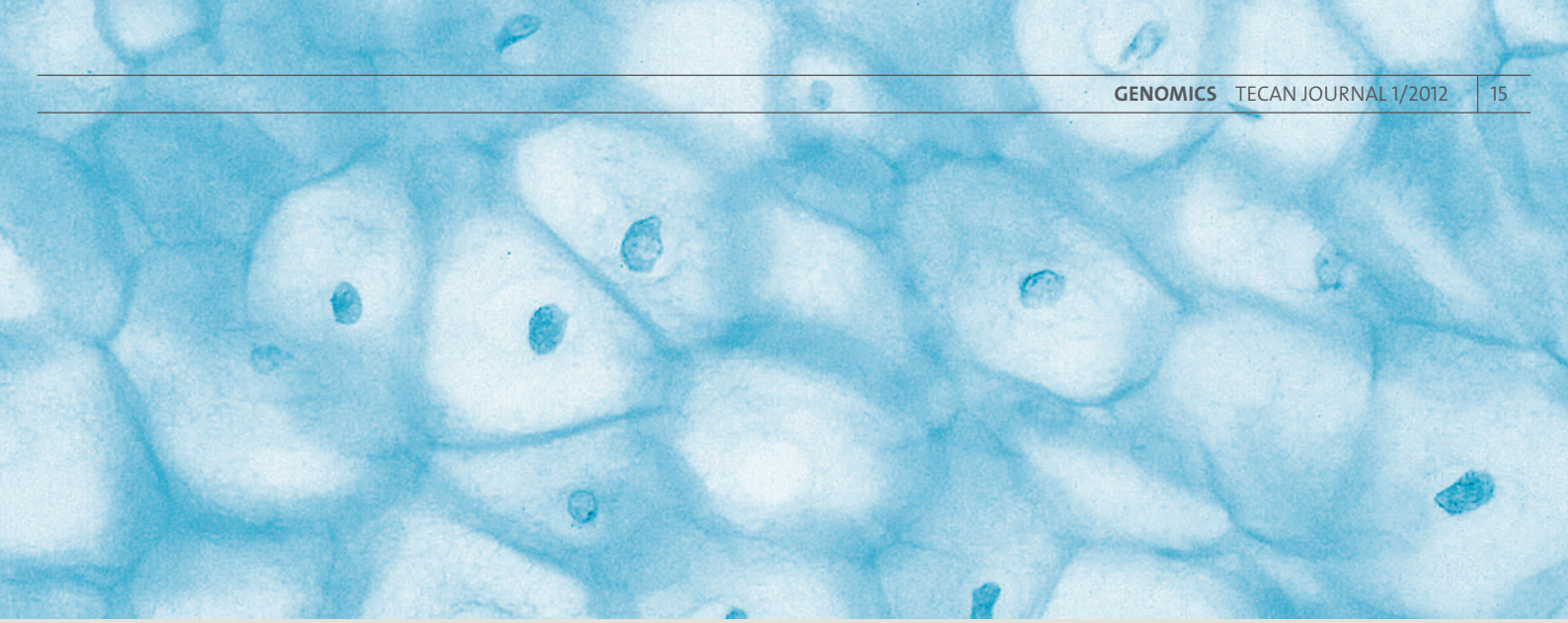
The Swedish national biobanking infrastructure, BBMRI.se (BioBanking and Molecular Resource Infrastructure of Sweden), has initiated a pilot study for the improvement and national harmonization of biobanking procedures in clinical cytology. Following a national procurement process, the first of 10 Freedom EVO® liquid handling platforms has been installed in the Clinical Cytology Biobank at the Karolinska University Hospital.

BBMRI
Biobanking and Biomolecular Resources Research Infrastructure

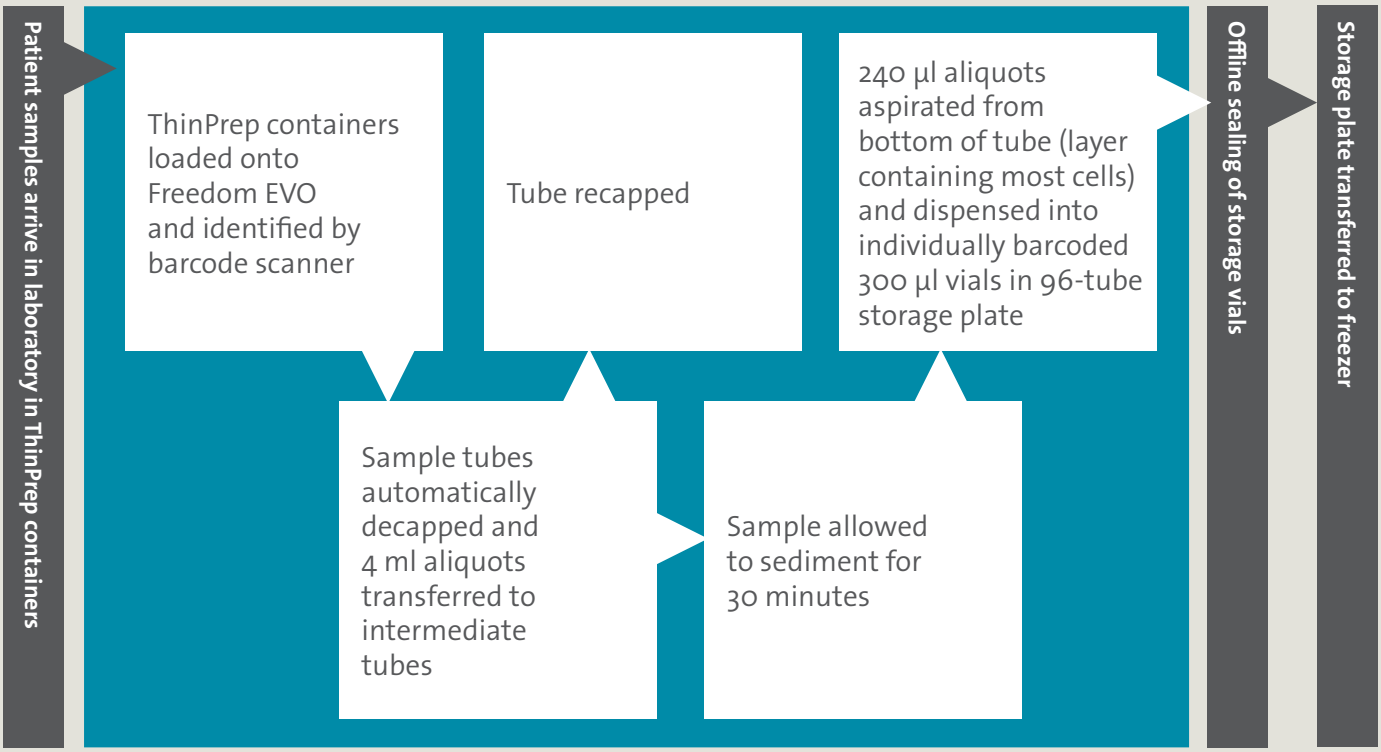
Nasrin Perskvist loading samples onto the Freedom EVO workstation

ThinPrep® Pap Test containers can be loaded straight onto the Freedom EVO

The Karolinska University Hospital at Huddinge, Sweden, is launching a new cervical screening algorithm that includes testing for human papillomavirus (HPV) persistence by testing for the virus in biobanked samples from previous screening rounds. HPV is a known cause of cervical cancer, and the use of HPV testing in cervical screening has long been under consideration. However, as many HPV infections clear spontaneously, it is necessary to know whether an infection is new or long-standing. Systematic biobanking will allow this new screening initiative to be introduced, and will also allow thorough comparative evaluation



Processing of 96 samples on the Freedom EVO workstation

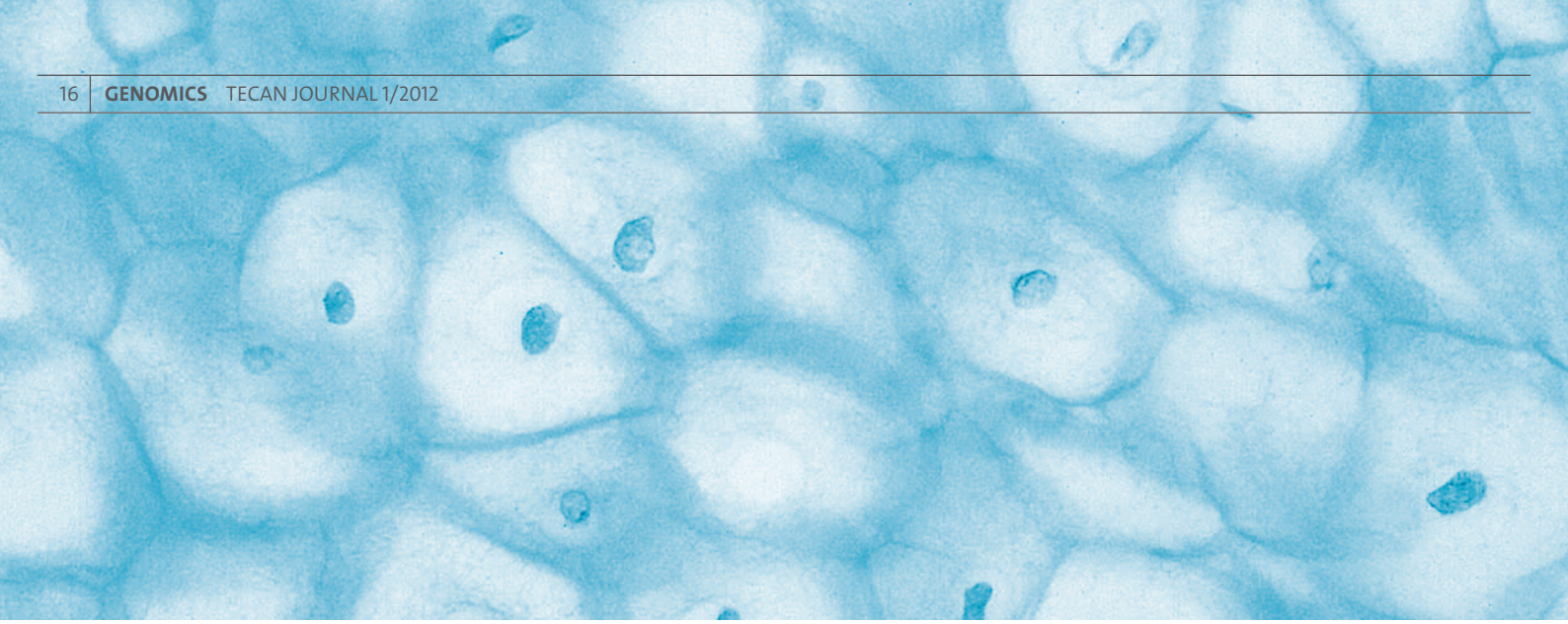


Summary of the Karolinska's current workflow

of the many new cervical screening tests that have recently been marketed.

In Sweden, cervical screening takes place every three to five years between the ages of 23-60, primarily using cytological procedures followed by HPV testing. Karolinska is now introducing an algorithm that instead initially performs HPV analysis, as has also been introduced in the Netherlands and Mexico. Nasrin Perskvist, Project Coordinator, explained: "Because of the importance of cervical cancer screening, the biobanking initiative will provide a vital resource for improvement and quality assurance of screening protocols and tests. These cells may also be useful for basic research on cervical cancer, as well as on other diseases that affect women. By launching a national cytology biobanking initiative we aim to provide a resource that improves both research and patient healthcare."

"We wanted to build a biobank using the cell samples from Sweden's national cervical cancer screening program. Liquid-based cytology is generally useful for both diagnostics and subsequent research, and storing these samples in a quality assured system offers many benefits for both researchers and patients." The project began in 2010, with Nasrin investigating temperature, cell concentration and other factors important for sample storage. Cervical cells are collected into PreservCyt®, a methanol-based medium, and can be stored at -20 to -25 °C without freezing. This is a significant advantage in cytodiagnostics, as slides can be made repeatedly – using different staining methods if required – without freeze-thaw cycling of the sample, maintaining good cell morphology. These cells are also a very good source of DNA and RNA for HPV testing or other biomarker analysis.



With support from the BBMRI.se, the Karolinska Hospital now has an automated method to provide good quality assurance and enable long-term storage of these samples. Nasrin continued: "We defined our specifications and then put out an invitation to tender. Several companies showed interest and, after careful consideration, we chose Tecan. We visited Tecan on several occasions to discuss and finalize the development and validation of the system in collaboration. We optimized the process manually, and within three months Tecan had adapted it to an automated system tailored to our needs. The system is based on a Freedom EVO® 150 liquid handling platform, equipped with 2-channel Liquid Handling (LiHa) and Pick and Place (PnP) Arms, a customized decapper and a barcode reader to provide full traceability of all samples. Final modifications – to accommodate real patient samples in ThinPrep® containers – and system optimization were performed on site."

Barcoded sample jars are moved to the decapper by the PnP Arm, and 4 ml of each sample is transferred to its corresponding intermediate tube by the LiHa. After a 30 minute sedimentation period – which is just as effective as centrifugation and fits nicely into the workflow with no periods of inactivity – a 240 µl aliquot of cells is transferred to the final storage plate, which contains 96 individually barcoded 300 µl vials. The barcodes are compatible with both the automation software and the LIMS, providing full sample tracking throughout the entire workflow. The final storage plate location is identified by the LIMS, which controls a spacious, electronic freezer and will ultimately link all the collaborating cytology laboratories that will eventually use the BBMRI.se system. Nasrin added: "Over the past few weeks, we have been able to run between 350 and 400 samples a day without any difficulty; a run of 96 samples takes 2 hours 40 minutes, which we are very happy with."

Karolinska University Hospital is the first site to trial the system which, once established, will be installed at other sites throughout Sweden. Almost 700,000 samples are collected annually across the whole of the country and, at present, 80 % of Sweden's national cervical screening program uses liquid-based sampling that is suitable for biobanking. In Stockholm – where some 100,000 samples are taken each year – there are three different cytology laboratories which all supply the biobank, and about 10,000 samples are already in storage, although it is too soon for any of them to have been used. "We need to announce the availability of this resource to all the relevant healthcare professionals and researchers, but by late summer/autumn 2012 the connections will be established. Everything has been developed in accordance with national regulations and ethical standards, and the beauty of the biobank is that it will benefit not only the cytology laboratories and the researchers, but also the patients themselves," said Nasrin. "Working with Tecan to develop this custom solution was very exciting. The joint expertise of BBMRI.se and Tecan has enabled us to achieve our overall aim of cost-efficient and high quality biobanking of these very precious samples."

To find out more on Tecan's Freedom EVO workstation, visit **www.tecan.com/freedomevo**

To find out more about the Karolinska Institute, visit **www.ki.se**

To find out more about Karolinska University Hospital, visit **www.karolinska.se/en**

To find out more about BBMRI Sweden, visit **www.bbmri.se**