ASKION

BBD Dresden

BioNTech AG

Charité Berlin

Inselspital Bern

LIFE Leipzig

UZA

The next generation biobank system

Reference Brochure

askion.com

Content

BioBank Dresden

Interview with Dr. Heidi Altmann - Biobank Manager

The BioBank Dresden (BBD) was founded in 2018/2019, in co-operation with the Medical Faculty of the Technical University of Dresden, the University Hospital Dresden (UKD) and the German Cancer Research Center (DKFZ). The BBD is a clinical, integrated biobank and consists of the Tumor and Normal Tissue Bank (TNTB), which has existed since 2008 and is affiliated with the Institute for Pathology and the Biobank for liquid samples (Dresden Integrated Liquid Biobank, DILB), which is located at the Institute for Clinical Chemistry and Laboratory Medicine (IKL).

The aim of the BBD is to support medical research with a focus on oncology in the long term by means of a standardized, systematic and high-quality collection and storage of patient samples from the UKD and associated data.

The BBD has a valid data protection concept and a positive ethics vote.

Dr. Heidi Altmann

Workflow of the Biobank

The samples are collected at the clinic directly and linked to a pseudonymized code, to align with all patient privacy and data protections guidelines and laws. Afterwards the samples are transferred manually, within a defined time frame, to the clinical chemistry laboratory.

There the samples are handed over to lab automation. From this point of time the robotic system prepares the subsequent steps, including cell isolation, nucleic acid isolation and purification, aliquotation, controlled rate freezing and sample storage.

All samples are tracked, starting with the sample collection, during the entire workflow to guarantee a maximum transparency and traceability for every sample.

The biomaterials managed by the BBD can be passed on to internal and external, national and international scientists and research groups within the framework of biological-medical scientific projects upon written request. The prerequisite for the transfer is the existence of a positive ethics vote for the respective scientific project and the examination and approval of the application by a scientific committee.

Why ASKION?

At the time when we decided on the ASKION C-line® systems, ASKION was the sole market leader in the field of cryopreservation including individual sample management.

The systems are robust and reliable and allow various types of samples, including cells and tissue which must be stored in cryogenic temperatures, to be stored and managed reliably over the long term.

The modular C-line® system, which can integrate different tank sizes, allows a flexible adaption to the growth of our biobank. Moreover, we consulted the biobank community to evaluate, if ASKION is a reliable supplier and received a clear and positive feedback.

Sample Data Management

The sample allocation takes place via a complete sample tracking from the acceptance in the clinics, over the processing in the laboratory up to the storage.

The sample-associated data is managed in a professional Biobank Information Management System (BIMS) CentraXX (Kairos).

There is an interface between the ASKION systems and the BIMS system, so that warehouse management takes place via CentraXX.

Recommendations for new operators

When planning a biobank you shall consider on the entire biobank-workflow, including sample collection, sample preparation, freezing of samples, sample storage/retrieval and documentation.

All these steps have to be evaluated and included into the planning process. Hereby all involved parties, such as IT, monitoring centre, building manager, ethics committee, data protection, shall be brought on board on an earlier stage.

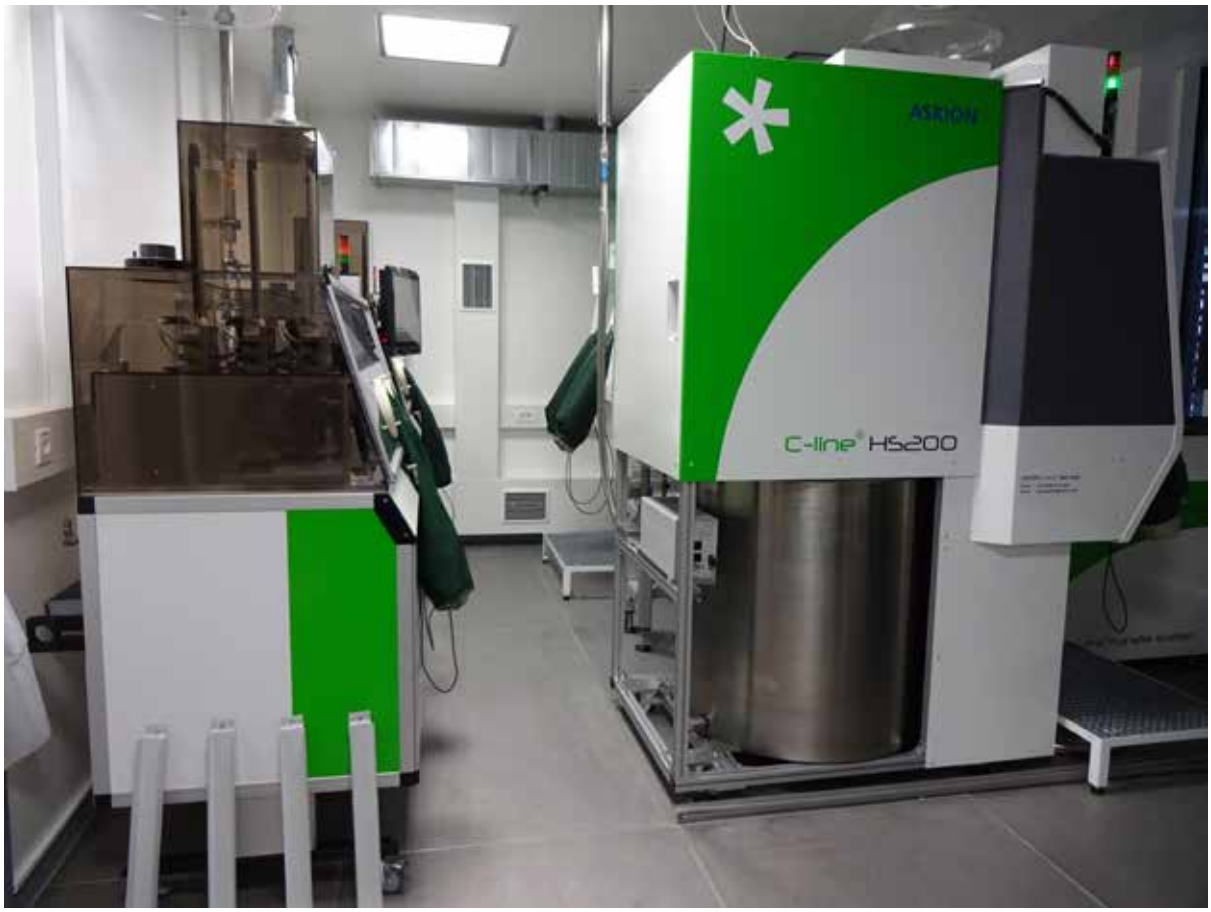
Last but not least you will need a good perseverance to establish your biobank

Always consider the entire biobank workflow when planning a biobank.

BioNTech AG

Interview with Dr. Christine Hawner - Head of Biosampling Automation Development

BioNTech AG is a fully integrated biotech company which combines all skills that are necessary for development and production of immunotherapies under one roof. The company was founded in 2008 as spin-off of the prestigious Johannes-Gutenberg University in Mainz and employs today more than 500 employees.



In its laboratory BioNTech isolates mononuclear cells of the peripheral blood that are frozen by the ASKION C-line® work bench and stored inside the ASKION C-line® HS200 afterwards.

Sample Format

BioNTech uses 1 ml barcoded tubes for filling and storing. The decision to use these tubes has been taken as they enable the automated sample handling and complete sample tracking starting from the receipt of the sample up to its analysis.

The Biobank

BioNTech preserves in its laboratory patient blood and tumor samples. Mononuclear cells are isolated from the blood and then frozen with the ASKION C-line® work benches. Afterwards the samples will be stored automatically inside the ASKION C-line® HS200 S storage tanks. Moreover, BioNTech uses the ASKION C-line® control software to manage manual storage devices, e. g. tissue storage for tissue samples. The samples are then used to analyse the mutation profile of the respective patient to produce an individualized cancer vaccine for every single patient.

A detailed description of the requirements on the storage system, the software and the premises is very important to set up a biobank.

Advantages of ASKION C-line®

The ASKION C-line® system allows BioNTech to freeze, store and retrieve patient cells in an semi-automated process without interrupting the cooling chain. This guarantees maintaining the quality of the valuable samples.

Device Installation

The system had to be installed at the top floor of the BioNTech main building. Therefore, a nitrogen line was installed up to the fourth floor to supply the ASKION C-line® system with nitrogen. Furthermore, the ventilation system had to be adapted to provide a sufficient air exchange.

Sample Management

The ASKION C-line® devices are integrated into a LIMS and a Manufacturing Execution System. Freezing and storage processes are controlled and managed by these two systems.

Charité Berlin, Central Biobank (ZeBanC)

Interview with Professor Dr. Michael Hummel - Head of ZeBanC

The Central Biobank Charité (ZeBanC) is a clinically integrated biobank that was established in 2011 by a funding of the Federal Ministry for Education and Research. Since 2013, the ZeBanC is established as a core facility of the Medical Faculty of the Charité-University Medicine Berlin and the Berlin Institute of Health (BIH). The ZeBanC is collecting various types of biosamples which derive from a broad spectrum of diseases including oncology, cardiovascular diseases, neurological disorders and others.

ZeBanC covers the entire process from sample acquisition, sample processing and storage. In addition, additional services such as DNA/RNA extraction, preparation of histological sections and virtualisation of histological sections are offered to partners within the Charité/BIH and to external academic and commercial partners.

The ZeBanC processes and stores various sample types ranging from fresh tissue to blood, urine, CSF as well as corresponding derivatives such as serum, plasma and buffy coat. Most of these samples are aliquoted and stored in 2D barcode tubes with a volume range from 0.5 to 3.0 ml. By using 2D barcode labelled tubes preventing confusion and misallocation of the tubes. Finally, freeze-thaw cycles can be avoided in the case of small aliquot sizes.

Decision for the ASKION C-line® system

At the time we launched the tender for a liquid nitrogen storage system, ASKION with its C-line® system could offer the most experience of storage biosamples in the gas phase of liquid nitrogen. This is further substantiated by the high number of installations all over Europe. Furthermore, the various sizes of the storage tanks allowed us to select a configuration that could be integrated into our buildings without major adaptations.

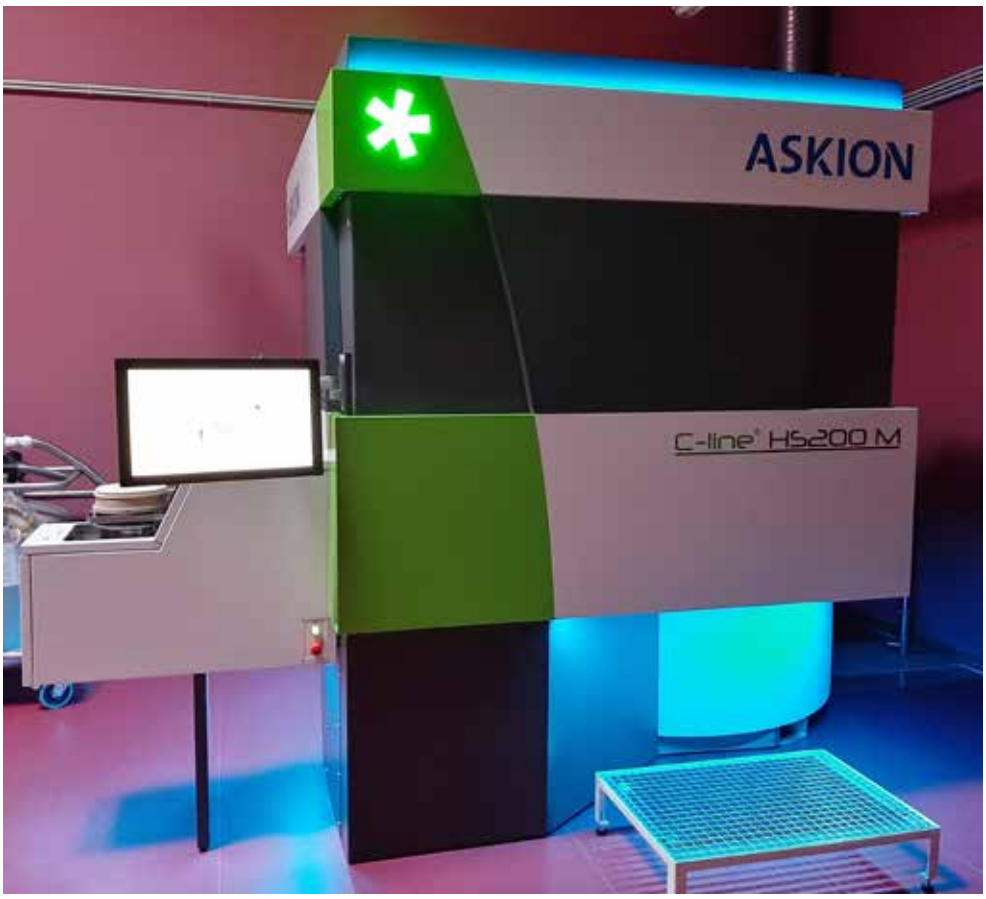
The possibility to store different types and sizes of tubes and also to change the configuration of the system during operation were further arguments in favour of the investment, as we rely on a high degree of flexibility.

Professor Dr. Michael Hummel

Workflow of the Biobank

The evaluation of the stakeholders and users of the biospecimens is of utmost importance.

The biosamples are collected at the clinical departments of the Charité with the informed consent of the patients. Initial processing of biosamples may be performed by the clinical partners or by the ZeBanC in order to ensure high sample quality. If the processing is carried out by the clinical partners, sample kits are provided which contain the sample collection tubes, sample tubes for aliquoting and a documentation sheet for annotating the biosamples. These samples are transferred to the biobank in batches. Samples that are processed by the biobank staff are processe d manually or via our automatic pipetting device, depending on the sample type. The biosamples stored in the ZeBanC can be provided to internal and external, national and international scientists and research groups within biomedical research projects upon written request. The prerequisite for the transfer is the availability of a positive ethics vote and the approval of the application by the principal investigators of the respective collection or the scientific use and access committee.



Biosampla Data Management

The annotation and allocation of the samples is carried out in our biobank information system CentraXX. Currently, the interface between the ASKION system and CentraXX (Kairos) is being set up allowing storage management and retrieval processes via CentraXX.

Recommendations for new Users

When planning a biobank, the evaluation of the potential stakeholders and users of the collected biospecimens is of utmost importance. Furthermore, the sample and data flow from acquisition to storage must be considered and analysed. Which additional partners are involved and how can they be supported by IT solutions? It is important to set up biobanking processes that can be easily integrated into the daily routine of the clinical departments and are scalable. In any case, it is more than advisable to draw on the expertise of already established biobanks.

Center of Laboratory Medicine, Inselspital Bern

Interview with Professor Dr. Carlo Largiadér - Head of Liquid Biobank

The Center of Laboratory Medicine has been commissioned by the Inselspital Bern to operate an institutional biobank for liquid biomaterial (e. g. whole-blood, serum, plasma or blood cells).

Professor Dr. Carlo Largiadér

Samples

The majority of the stored samples are serum and plasma samples. The Liquid Biobank Bern makes use of FluidX cryotubes of different sizes (270 ul, 525 ul or 1.8 ml) to store samples. The decision was based on the fact, that current analytical methods require relatively small sample volumes. In order to be cost-effective, the Liquid Biobank Bern focused on small-sized formats.

Workflow of the Biobank

The samples are collected at the clinic and entered into the information system right away by bedside scan. Afterwards, the samples are immediately transported to the Center of Laboratory Medicine, where they are scanned at the LIMS and processed automatically by centrifugation.

In the next step, aliquoting is performed by a pipetting robot. The aliquots undergo controlled rate freezing at the ASKION C-line® work bench and remain temporarily stored there until they are allocated to a compartment within the main storage facility. An order can be placed through the Biobank Information System (BIMS) and samples are dispatched to the ASKION C-line® work bench, where they await shipment or further processing.

One of the priorities during build-up of a biobank should be the planning of the biobank information system and therefore the provision of enough financial reserve and buffer time for the chosen IT solutions.

Workflow of the Biobank

The biggest obstacle during the installation of the ASKION C-line® system was establishing the connection to the Biobank Information System (BIMS).

All the samples part of the Biobank are managed centrally by a web-based laboratory information management system (LabVantage), which is coupled with the laboratory's own system, the pipetting robot, ASKION C-line® work bench, Hamilton BiOS M automated storage system and the service recording and invoicing system.

Although, the cost and time management of the necessary infrastructure was effective, the integration of the various devices and their control software systems into the local IT network proved to be a challange.

Decision for ASKION C-line®

The Center of Laboratory Medicine conducted a market analysis to figure out which system would fit best. On the basis of this analysis, there was only one system (ASKION C-line® system) that fulfilled the two desired requirements for the Biobank: A fully automated storage system to store samples at ultra-low-temperatures below -140°C and a connection of the entire system to a higher-level BIMS.

Prior to the system installation it was necessary to implement a pipeline for the transport of the liquid nitrogen from the central storage to the biobank.

It is equipped with a barcode that allows tracking and identification of the samples inside the ASKION C-line® system safely at any time.

Inselspital Bern

Leipzig Research Center for Civilization Diseases (LIFE)

Interview with Dr. Ronny Baber - Manager Biobank

The Leipzig Research Center for Civilization Diseases (LIFE) of Medical Faculty of Universität Leipzig was started in 2010 and has its major focus on searching for molecular and lifestyle associated causes of civilization diseases.

One central institution of the project is the LIFE Biobank. The biobank infrastructure was established for the LIFE project and is available since 2011. The LIFE Biobank was extended two times now offering a capacity for 1.4 million samples.

The LIFE Biobank focusses on the storage of liquid biospecimen so most of the samples are serum, plasma and urine. In addition, peripheral blood mononuclear cells and nucleic acids were extracted from whole blood of study participants and stored in the biobank.

Furthermore, the LIFE Biobank produces and stores dried blood spot cards and preserves biopsies of umbilical cord and placenta and special material like saliva, feces, breast milk and hair. Due to higher sample stability and better tightness compared to conventional storage vials, the biobank uses straws and cryotubes to store their samples.

Dr. Ronny Baber

From sample collection to sample managment

Blood samples and urine of study participants are collected at the ambulances and arrive not later than 60 minutes after collection at the preanalytical laboratory. After subsequent centrifugation of a majority of the samples, the liquid components will be transferred to secondary tubes.

Serum and plasma are automatically filled into 0.3 or 0.5 ml straws using an aliquoting robot (DIVA system – Cryo Bio Systems IMV) and temporarily frozen at –80°C.

Afterwards the samples will be transported on dry ice to the biobank where they are presorted for storage in the cryogenic working area (below -100°C). Using liquid nitrogen cooled dewar containers, the samples are transfered to the HS200 and stored to their previously allocated storage location.

For sample management the LIFE Biobank uses a LIMS called „CryoLab" developed by LIFE. This LIMS can also communicate with the HS200 for automated storage and retrieval of samples.

It is advisable to attend relevant meetings to discuss with representatives of established biobanks and industry. Additionally, several biobanks should be visited to learn from experienced operators.

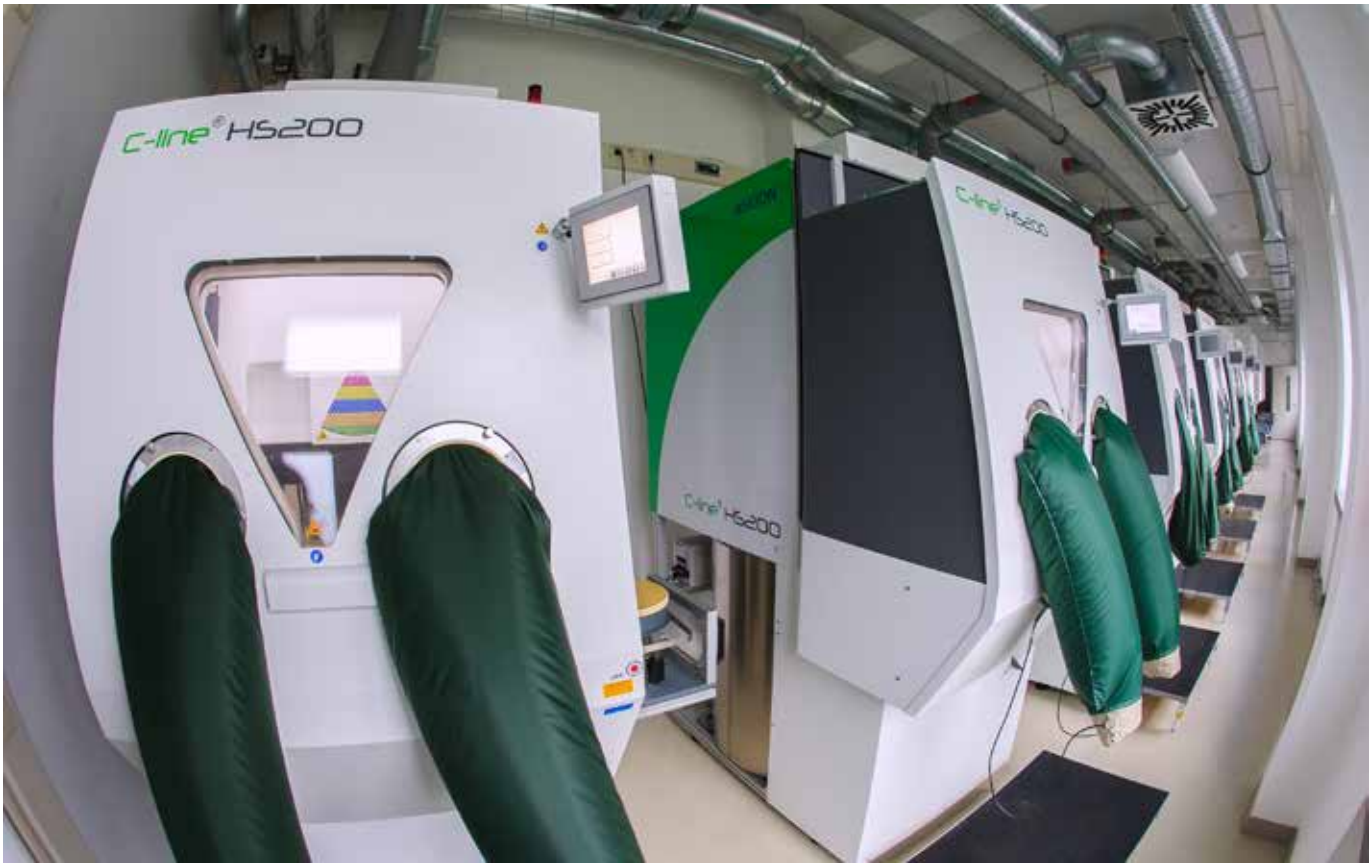
Advantages of the ASKION C-line® system

For storage, sorting and retrieval of samples it is very important to provide an uninterrupted cooling chain. Because the ASKION C-line® system is the only system that guarantees an uninterrupted cooling during storage and handling of the samples, this system was selected for the LIFE Biobank.

The ASKION C-line® system has working areas at temperatures below –100°C due to active cooling using the gas phase of liquid nitrogen. In the process of the infrastructural development the LIFE Biobank underwent three expansion steps.

The first step was the installation of five HS102. Due to the continuously growing number of samples further expansion steps were necessary.

During the first expansion of the biobank in 2013, six HS200 S have been purchased and installed. For the second expansion of the biobank some structural changes had to be made. By extending nitrogen lines, exhaust systems and security installations space for another four HS200 S was generated of which three devices have been purchased and installed in 2014.



University Hospital of Antwerp (UZA)

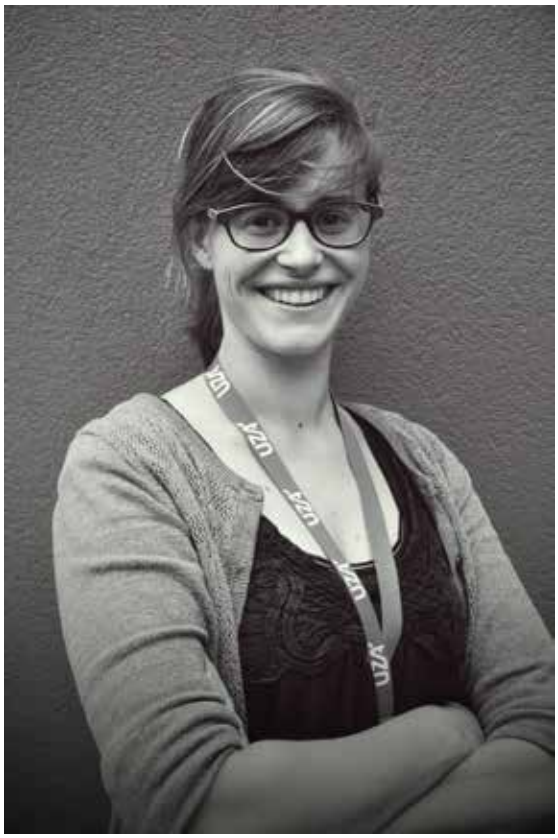
Interview with Sofie Goethals - Biobank Manager

In March 2008 the Belgian National Cancer Plan (NCP) was launched by Mrs. L. Onkelinx, Federal Minister of Social Affairs and Public Health. To promote translational cancer research and the collaboration between different cancer researchers in Belgium, one of the initiatives of the NCP (initiative 27) was the creation of a Belgien Virtual Tumourbank.

By this initiative governmental funding was made available to create and maintain a tumourbank. Furthermore, the Flemish Biobank Initiative (formerly CMI), a non-for-profit organization, was officially founded in December 2009 through a collaborative effort between the Flemish Government, the Flemish Ministry of Economy and Scientific Affairs, the 5 Universities and the 4 University Hospitals and representatives of Healthcare Industry.

The Flemish Biobank Initiative supported the realization of 5 pilot biobanks in different disease domains: sudden cardiac death, hepatotropic viruses, diabetes, inflammatory bowel disease and rheumatoid arthritis.

Since 2012 the UZA focuses on sudden cardiac death, hepatotropic viral diseases.



Sofie Goethals

Decision for the ASKION C-line® system

UZA wanted a fully automated system for storage and retrieval of samples that could keep the uninterrupted cooling chain at temperatures below -100°C throughout the whole processing and storage/retrieval process of the samples.

Since 2012 the UZA focuses on sudden cardiac death, hepatotropic viral diseases. At the UZA fresh frozen and paraffin embedded tissue, blood and blood products, such as plasma, serum, buffy coat and urine are stored.

To enable the lab-automation and storage in the ASKION system the standardized non-label formats 2 ml and 600 µL 2D barcode bottom prelabeled vials are used. The usage of these formats speeds up the handling and registration process of the samples significantly and reduces the risk of human errors.

Biobank workflow

The UZA receives primary samples for the biobank either directly, through pathology department or clinical chemistry lab of the hospital. The samples are processed (manually) into fractions. Registration is done semi-automated using the biobank software package SLims (Genohm). Then the samples are snap-frozen in liquid nitrogen and, depending on the sample type, either stored in mechanical -80°C freezers or in the ASKION C-line® system.

Automated biobank storage does not only influence the stroage/retrieval process but also the complete workflow. Therefore, it is neccessary to consider every detail of the process and talk to people in the field with experience in biobank automation. Furthermore, people with sound IT skills have to be involved from the beginning of the project.

Structural Preparation

Prior to the installation of the system a new building was created to fulfill the requirements on, for example, liquid nitrogen supply and to provide the necessary space. Furthermore, safety aspects, such as oxygen sensors and extra ventilation as well as central 24/7 alarm monitoring system, have been taken into consideration during planning.

Sample Management

The whole sample management process is done by one LIMS system, from the Belgien-Swiss company Genohm, called SLims. SLims is connected to different other in house databases at UZA. All storage and retrieval processes of the ASKION C-line® system are completely integrated in and managed by SLims.

ASKION

ASKION GmbH
Gewerbepark Keplerstrasse 17-19
07549 Gera
Germany

+49 (0) 365 - 73 53 0
+49 (0) 365 - 73 53 40 2
cryo.sales@askion.com

askion.com

ESF EUROPE FOR THURINGIA EUROPEAN SOCIAL FUND
EUROPEAN UNION European Social Fund
EFRE EUROPE FOR THURINGIA EUROPEAN REGIONAL DEVELOPMENT FUND
EUROPEAN UNION