# Finding the perfect match

**The success of hematopoietic stem cell donation is highly dependent on a close match between the donor and recipient human leukocyte antigen (HLA) alleles. DKMS Life Science Lab performs HLA typing of over a million potential donors a year, relying on automation to provide a cost-effective, high quality solution that delivers reliable high sample throughput.**

## DKMS Life Science Lab

Johanna Andreas,
Automation Specialist

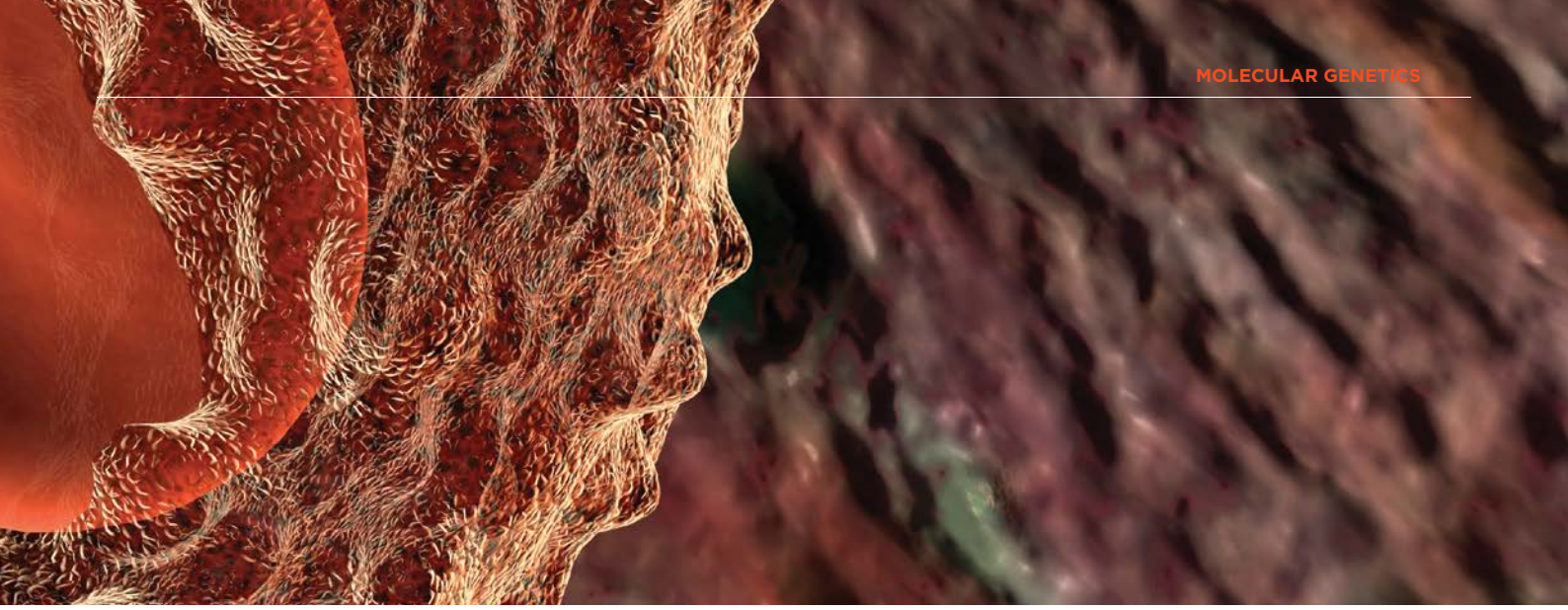
Hematopoietic stem cell transplantation is a treatment option for patients suffering from certain cancers of the blood, such as multiple myeloma or leukemia. For the transplant to be successful, it is essential that the donor's HLA type closely matches the recipient's HLA type, minimizing the potential for rejection. Some patients are fortunate enough to find a donor within their own family, but the majority will depend on a donation from a completely unrelated person. However, the likelihood of finding a suitable donor outside the family is very low. To maximize the chances of finding a match in as short a time as possible, donor registries have been established around the world.

With over six million registered donors, DKMS is the world's largest bone marrow donor center, and its Life Science Lab in Dresden, Germany, is one of the most advanced genotyping service providers globally. Rapid, reliable HLA typing of potential donors is essential, requiring the extraction of DNA from blood or buccal swab samples to determine the exact genetic profile of the donor. Vast numbers of samples are screened each week, which would be difficult – if not impossible – to do manually. Automation is the obvious solution, allowing procedures to be standardized and more samples processed, more rapidly and with greater reliability, helping to reduce the number of repeat analyses required. This saves both staff time and reagent costs, ensuring that analytical workflows are as efficient and cost effective as possible. Johanna Andreas, Automation Specialist in the Laboratory Technology Department, explained: "Our laboratory types around 1.3 million samples a year – 25,000 a week! To cope with this workload, we use liquid handling workstations to automate our protocols, helping to streamline the various workflows."

Automation on a Freedom EVO platform enables cost-effective, high throughput HLA typing

Johanna continued: "When blood samples arrive at the laboratory, they are automatically aliquoted from blood collection tubes into 96-well plates, ready for DNA isolation. Until recently, this was performed on an older Tecan liquid handling platform which, after nearly 10 years of service, has been replaced by a Freedom EVO® 150. With just a single Liquid Handling Arm™ (LiHa), this is the most basic Tecan platform in our lab, but it offers straightforward, robust performance for this simple, highly repetitive task."

"Once the DNA has been isolated, it is quantified by fluorescence measurements using an Infinite® 200 PRO reader. This was originally a standalone instrument, which in 2016 was integrated into an additional new Freedom EVO 150; the fifth of its kind in our lab. Prior to this, DNA



quantification was a tedious job for the lab personnel, as each plate had to be measured independently. This new platform also features a plate storage carousel – based on a LiCONiC LPX220 – as well as a refillable trough for SYBR® Green dye reagent. This set-up enables the quantification of 70 plates in a single run, a real time and workload saver."

"The samples are then reformatted on a Freedom EVO 200 workstation, sorting them into 384-well plates containing either low or high concentrations of DNA in preparation for the next stage of the typing process, PCR. This workstation uses two LiHas to reformat two separate panels in parallel, helping us to manage our high throughput requirements."

"We have successfully automated both microplate- and microfluidics-based PCR protocols on two additional liquid handling platforms – a Freedom EVO 150 and a Freedom EVO 200. The PCR method of choice is dependent on the DNA concentration of the sample. For high concentration samples, we use the microfluidics-based assay. The samples, molecular identifiers and master mixes are transferred to the sample inlets of a 192.24 Dynamic Array™ IFC (Fluidigm), and target-specific primers are added. The entire reaction takes place within the chip, and so the reagent volumes used are really small – the total assay volume is less than 10 nanoliters – which helps reduce the cost of the assay. For low concentration DNA samples, PCR is performed in 384-well plates. Finally the PCR products are harvested, pooled, purified and quantified, ready for HLA amplicon sequencing and analysis using Illumina next generation sequencing technology."

In addition to offering higher throughput capabilities, automation helps to enhance the quality and reliability of analytical protocols. This is reflected by the low number of repeat analyses performed by the laboratory. "Despite an ever-increasing workload – we are now typing tens of thousands of samples each week – the number of repeat measurements we perform is steadily decreasing. Our PCR assays look at 12 different loci and, even if an analysis is inconclusive and needs to be repeated, we still save time by performing automated cherry-picking overnight – also on Tecan platforms."

"We have been using our Tecan liquid handling workstations for almost 10 years now, and are very happy with them. The large workdecks have space for a selection of different carriers, making the systems very versatile and giving us the flexibility to use them for a range of assays. Most importantly, they are reliable systems and, in the case of any issues, we receive good support. This is absolutely essential when you have such a high sample throughput, as any unplanned downtime can cause a huge backlog to build up very quickly," concluded Johanna.

The Freedom EVO offers straightforward, robust pipetting of samples

**To find out more about Tecan's molecular diagnostics solutions, visit www.tecan.com/genomics**

**To learn more about DKMS, visit www.dkms-lab.de**

> "Most importantly, they are very reliable, [which] is absolutely essential when you have such a high sample throughput."