



MORE PRECISION FROM SMART DATA

The high-quality specimen in Indivumed's biobank can be regarded as a complete data set of tumor biology. Applying cutting-edge bioanalytical techniques, they are transformed into a multi-omics database. Powerful bioinformatic tools and smart algorithms are then used to extract data and to transform them into knowledge for precision oncology.

UNLOCKING THE DATA TREASURE

PRECISION ONCOLOGY In hardly any other field has the concept of personalized medicine become a clinical reality as it much as in the battle against cancer. Digitization and the advent of powerful data analytics tools such as machine learning drive this development. Here is a selection of players from the North that are leading the field.

The premise of precision oncology in the battle against cancer is to develop treatments that target the molecular and cellular characteristics of an individual's tumor. The question of where in the body a tumor originated has lost in importance, and instead treatment concepts focus on the molecular profile of cancer cells in the body. But for the dream of precision oncology to be fully realized, such therapies must help more people with cancer than the 5–10 percent who currently benefit. The advent of artificial intelligence and other powerful bioinformatics applications is regarded as a game changer for precision cancer medicine. These technologies help to analyze the huge and complex data sets found in large electronic health databases. Practically every drug developer is adopting smart approaches to using machine learning and big data analytics to turbocharge their R&D.

High-quality multi-omics data sets

In a world that is fueled by exponentially growing knowledge, the source and the quality of data are of major importance. Hartmut Juhl, the founder and CEO of → [Indivumed GmbH](#), sees his company as a key enabler for cancer research and the development of new therapeutics, as it has one valuable asset: a uniquely strong tumor database. “It is a powerful resource which fully deciphers the complexity of cancer biology for every patient, to understand the disease, to target the cancer according to what is available – and to develop new compounds,” Juhl says.

Over the last 20 years, the Hamburg-based biobanking specialist has built up a global network of affiliated clinics that obtain

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CEO, INDIVUMED

cancer patient tissues in frozen samples as well as blood samples and additional relevant clinical data. The key to high-quality specimen in Indivumed's biobank was the implementation of highly standardized and stringent sample collection procedures in numerous clinics worldwide, enabling comparability and reliability of biological and clinical data across tumor entities, hospitals, and different regions.

Now this elaborate approach is paying off. In recent years, Indivumed has started to unlock the informative power of its biospecimen collection not only through R&D services, but by extracting a complex set of relevant biological data from it. “Our frozen material can be regarded as a complete raw data set of tumor biology”, mentions Juhl. In order to transform the raw data into a multi-omics database, the Indivumed team applied a set of exceptional bioanalytical techniques such as whole-genome sequencing, phosphoproteome, proteome and transcriptome analyses. “Combined with clinical and outcome information and by applying bioinformatic tools and artificial intelligence algorithms, we are able to extract data from individual cases of cancer in a wholly unique way”, he says.

To strengthen its informatics, Indivumed has recruited a team of IT specialists, bioinformaticians and data scientists. It has also entered significant partnerships with IT-driven companies or academic partners to build its digital and data analytics expertise. A recent milestone in summer 2021, Indivumed introduced nRavel, an artificial intelligence-based bioinformatics platform developed in-house to support precision cancer research. The new product marries the oncology firm's multi-omics database with machine learning and a series of powerful analytics tools.

“This discovery platform enables us to routinely analyze our multi-omics datasets against virtually any issue that is currently coming up in oncology,” Juhl explains. The translational cancer researcher is fascinated by its speed: “By applying nRavel, we have for example, identified a bunch of different novel drug targets for functional antibodies within a few weeks,” he says. Experimental studies already showed promising data regarding the functionality of these targets, he says.

It is exciting results like these that have led Indivumed to embrace the development of new targets and early drug discovery on its own and in strategic partnerships with pharma companies. Indivumed has co-founded two biopharma companies for therapeutic development against several novel targets in 2021. “We are transitioning from being just a technology platform provider to becoming an AI-driven oncology biotech company. We utilize our own innovative power for product development, as well as collaborate with as many partners as possible, to fully unlock the tremendous value of our database for the benefit of future cancer patients,” Juhl points out.

AI-based cancer diagnostics

Other players in the North are unlocking the revolutionary potential of machine learning for improving clinical diagnostics in cancer medicine. In order to provide faster test results in

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CARSTEN BOKEMEYER
DIRECTOR OF THE UNIVERSITY
CANCER CENTER HAMBURG (UCCH)

pathology, the Hamburg-based start-up → **Mindpeak GmbH** has developed a deep-learning solution that recognizes and classifies breast cancer cells in tissue samples taken in a fraction of a second. In May 2021 the AI-based software received its CE-IVD mark. “This makes us the first company in Germany with such an approval in clinical routine diagnostics in pathology,” says Co-founder and CEO Felix Faber.

Hamburg-based → **FUSE-AI** is also developing intelligent solutions for radiologists to detect lesions in MRI and CT scans faster and more accurately for various indications like prostate cancer and other indications. In close collaboration with clinics in Germany and Switzerland, the company has been developing an AI-based radiological diagnostic software “prostate.carcinoma.ai” since 2019. Approval as a medical device under EU MDR as well as by the FDA is expected in mid-2022.

Oncology Center of Excellence in the North

At the University Cancer Center Hamburg (UCCH), precision oncology has become an indispensable part of daily routine. “In 2015, we introduced our molecular tumor board which comes as a new addition to our 22 interdisciplinary tumor conferences per week,” says Carsten Bokemeyer, Director of the UCCH and Medical Director of the II Medical Clinic for Oncology and Hematology at the → **University Hospital Hamburg-Eppendorf**



PROF HARTMUT JUHL
The cancer researcher is founder and CEO of Indivumed GmbH based in Hamburg.



**PROF CARSTEN
BOKEMEYER**

Director of the University Cancer Center Hamburg (UCCH) – Hubertus Wald Tumor Center and Medical Director of the II Medical Clinic for Oncology and Hematology at the University Hospital Hamburg-Eppendorf (UKE).



(UKE). “In 2020 among 14,500 tumor patients discussed, about 25 to 30 percent were receiving recommendations based on their molecular tumor profile. The specific molecular board is now specifically directed to patients where established therapies are no longer available or molecular therapies have already failed.”

IT technology and artificial intelligence applications are also making roads here. The team led by Frank Ückert, Director of the new Institute for Applied Medical Informatics at UKE, for example, develops solutions to transform highly complex data from the molecular tumor boards into knowledge that can be used for diagnostic and therapeutic decisions.

“For our molecular tumor board patients, we have also established special consultation hours to discuss the results with them”, Bokemeyer says. It is because of offers like this, but also the close integration of translational research and treatment, including the implementation of innovative early clinical studies, that German Cancer Aid has once again elected the UCCH as an Oncological Center of Excellence – one of only 14 in Germany. “This is a recognition of our intensive efforts to

strengthen translational cancer research and to focus directly on the needs of our patients,” says Bokemeyer.

The award as a Center of Excellence is associated with funding of three million euros. An important goal of the UCCH in the new funding period is to form a North German competence network for cancer research and medicine with the University Hospital of Schleswig-Holstein (UKSH) in Kiel and Lübeck, thus integrating these sites into a consortium with the Hamburg Top Center.

“We have already established several connections with colleagues at the Cancer Center at the University Hospital Schleswig-Holstein. Through superregional networking in the fields of translational research and clinical care, we want to be able to offer every patient in northern Germany the chance to benefit from recent innovations in cancer medicine,” says Bokemeyer. “In 2024, we plan on applying to German Cancer Aid as a Northern Germany Oncology Consortium together with the Cancer Centers in Kiel and Lübeck, the UCC-SH,” says Bokemeyer. pg