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Outstanding ideas – new imaging processes for cancer diagnostics and nanopropellers for ocular gene therapy

The summer reception hosted by BioRegio STERN Management GmbH has once again provided a fitting backdrop for the Science2Start award ceremony. Last Thursday, at Tübingen observatory, was the 15th time that scientists and start-up founders were celebrated for outstanding ideas that a panel of experts judged to have special economic potential.

First place went to Dr. Kilian Wistuba-Hamprecht, Prof. Manfred Claassen, Dr. Saskia Biskup, Dr. Aaron Mayer and Prof. Christian Schürch. As part of their "Vicinity Bio" project, they are developing products for research and digital cancer diagnostics using high-dimensional in situ proteomics imaging and AI-supported analysis processes. Second place was awarded to the team from University Eye Hospital Tübingen led by Dr. Sven Schnichels and Dr. José Hurst for their "REVeyeVE" project that centres on a steerable and degradable nanopropeller for ocular gene therapy. The judging panel gave out two third-place prizes. The first of these went to Dr. Latifa Zekri from the Clinical Collaboration Unit Translational Immunology. She and her team have developed an ACE2-M fusion protein that can be used as a new treatment for SARS-CoV-2. ACE2-M works as a virus neutraliser, and is also effective against the various SARS-CoV-2 escape variants. The second third-place prize was presented to Michael Pfeifer, Markus Schandar and Richard Rösch from the Fraunhofer Institute for Manufacturing Engineering and Automation IPA for "SteriDoc", a technology that simplifies sterile connectivity in the lab.

The BioRegio STERN Management GmbH summer reception was organised jointly with Verein zur Förderung der Biotechnologie und Medizintechnik e. V. and Technologiepark Tübingen-Reutlingen (TTR) GmbH. This major regional gathering for entrepreneurs, scientists, investors and politicians from the sector also hosted the 15th Science2Start award ceremony. These awards recognise life sciences ideas that have particular economic promise and have been developed by scientists and start-ups from the region. The prizes, worth a total of 5,500 euros, were again sponsored by Voelker & Partner, a firm of lawyers, tax consultants and auditors. In her keynote, guest of honour Dr. Viola Bronsema, Managing Director of BIO Deutschland, congratulated the winners on their outstanding achievements.

The winners of the 2024 Science2Start competition

1st place: "Vicinity Bio"
High-dimensional imaging for cancer diagnostics and research

Dr. Kilian Wistuba-Hamprecht, Prof. Manfred Claassen, Dr. Saskia Biskup, Dr. Aaron Mayer and Prof. Christian Schürch.

Checkpoint inhibitors, cancer vaccines, adoptive cell transfer and genetically modulated cell therapies – there are now a great many promising approaches in cancer immunotherapy. However, the broader the range of treatments that are available in the future, the more important biomarkers become when selecting the best possible treatment for specific patients. Vicinity Bio utilises innovative technology platforms (high-dimensional in situ proteomics imaging), specialist expertise and AI-supported analysis processes to identify biomarkers for alternative treatment options and help clarify mechanisms for future treatments in cases such as tumour or inflammatory diseases. Vicinity Bio product lines can visualise more than 150 markers with subcellular resolution on a single tissue section (e.g. a biopsy) and thus provide a high-dimensional depiction of the composition of tumours, their invasive front and the adjacent, non-malignant tissue, for example. Vicinity Bio complements conventional pathological investigations and combines the fields of immunology, cell biology, biochemistry, oncology, pathology and computer science in the context of biology at spatial resolution. The aim is to personalise well-founded treatment recommendations on the basis of high-dimensional and digitalised cancer diagnostics.

2nd place: "REVeyeVE"
Steerable and degradable nanopropellers for ocular gene therapy

Dr. Sven Schnichels and Dr. José Hurst, University Eye Hospital Tübingen

When it comes to introducing gene therapies such as RNA and DNA plasmids into eye tissue, there are still major hurdles to be overcome. Current treatments, both in hospitals and in development labs, are largely based on viral vectors. However,

besides the issue of immune responses, the efficiency of this approach is often inadequate or it may not be possible to reach the right target cells. REVeyeVE – a project emerging from preclinical research – is a novel, non-viral gene therapy vehicle using nanopropellers that are steered through the eye with the aid of magnets and ultimately release their therapeutic agents at the appropriate location on the retina. This is a potential treatment option for patients with hereditary and previously untreatable retinal diseases. Compared to current treatments, the nanopropellers have the advantage that they can be modified and are highly flexible. For example, they can deliver various RNA types as well as large genes. Transfection using the nanopropellers exhibits excellent efficiency, which means that DNA and RNA can be delivered more successfully than with other methods. Moreover, the nanopropellers are degradable and extremely biocompatible.

3rd place: "Virus neutraliser"
An ACE2-M fusion protein as a treatment for SARS-CoV-2

Dr. Latifa Zekri from the Clinical Collaboration Unit Translational Immunology, which is based at University Hospital Tübingen, the German Cancer Research Center (DKFZ) and the German Cancer Consortium (DKTK), Prof. Gundram Jung, Prof. Helmut Salih and Prof. Michael Schindler from University Hospital Tübingen

The team has developed an ACE2-M fusion protein that can be used as a new treatment for SARS-CoV-2. ACE2-M works as a virus neutraliser and is also effective against the various SARS-CoV-2 escape variants. The project is being funded as part of the beLAB2122 partnership.

There is a pressing need for effective, antiviral reagents for treating current and future viral infections. During the COVID-19 pandemic, monoclonal antibodies with a potent neutralising effect were developed, most of which target the receptor-binding domain (RBD) of the viral spike protein, which binds with the ACE2 receptor on the target cells. Several of these reagents were licensed for use in the early stages of infection. However, their neutralising effect has diminished due to successive mutations in the SARS-CoV-2 variants. By contrast, the spike protein of the Omicron variant has developed a higher affinity for the ACE2 receptor, which has led to increased virus infectivity. The team has developed a virus neutraliser – an ACE2-Fc fusion protein called ACE2-M that can neutralise all SARS-CoV-2 variants. ACE2-M has been designed and characterised to counteract viral immune evasion, which makes it especially effective against newly emerging coronaviruses as an aspect of pandemic preparedness.

3rd place: "SteriDoc"
Simple sterile connector for lab use

Michael Pfeifer, Markus Schandar, Richard Rösch, Fraunhofer IPA, Stuttgart

Liquid handling is a key process in the production of state-of-the-art treatments, such as those that use the body's own cells, and has to be carried out in open vessels under cleanroom conditions. SteriDoc makes it possible to carry out production within a closed system, which means that the requirements as regards the surrounding environment can be relaxed. The concept centres on a connection device and a needle-like consumable that is heat-sterilised and then inserted through the septum (penetrable membrane) of a small vial. The connection device utilises an induction coil or heating element to supply the energy needed to heat a conductive needle that has a partial sterile sheathing. The aperture of the needle is opened at the moment it is inserted into the vial. This means that sterile connection processes with vials can be carried out in cleanroom facilities that have lower classifications and, hopefully, in the future, outside cleanrooms.

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