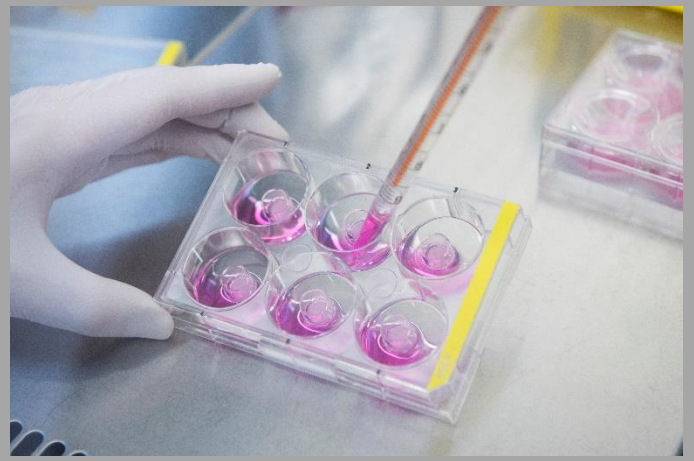
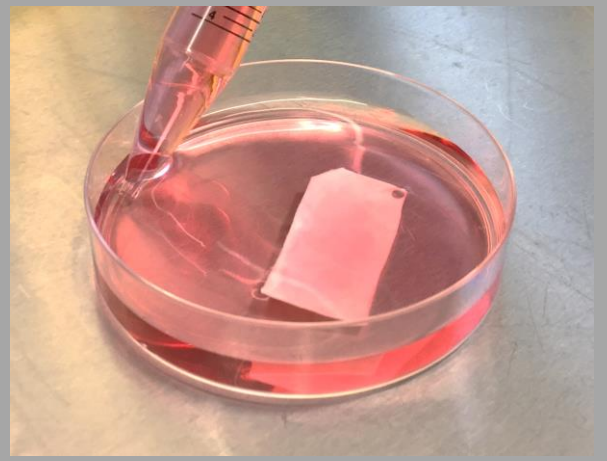
Munich | 29.11.2019

Automated Lab at Fraunhofer Translational Center for Regenerative Therapies

Dr. Sofia Dembski

Translational Center Regenerative Therapies TLZ-RT, Fraunhofer Institute for Silicate Research ISC, Würzburg
Department Tissue Engineering and Regenerative Medicine (TERM), University Hospital Würzburg


Danish-Bavarian Workshop on Robotics/ICT in Horizon 2020

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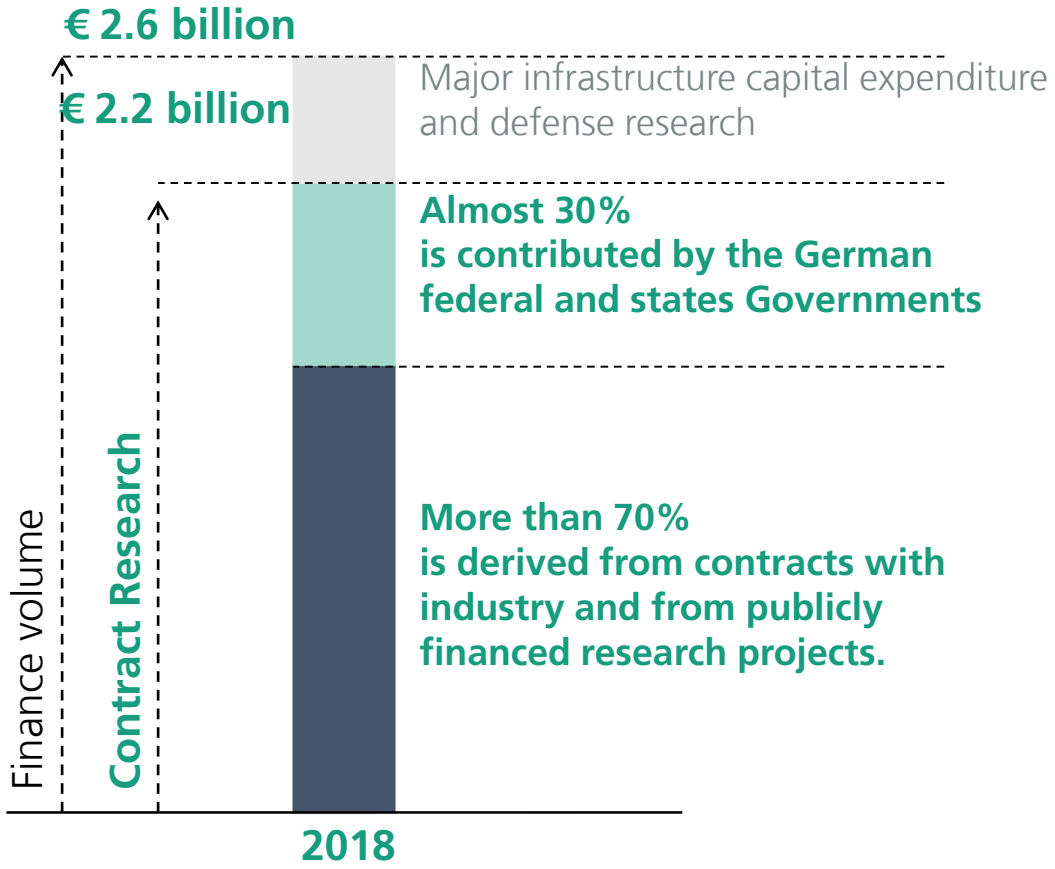
The Fraunhofer-Gesellschaft at a Glance

The Fraunhofer-Gesellschaft undertakes applied research of direct utility to private and public enterprise and of wide benefit to society.

26,600 staff

72 institutes and research units



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Fraunhofer Institute for Silicate Research ISC, Würzburg

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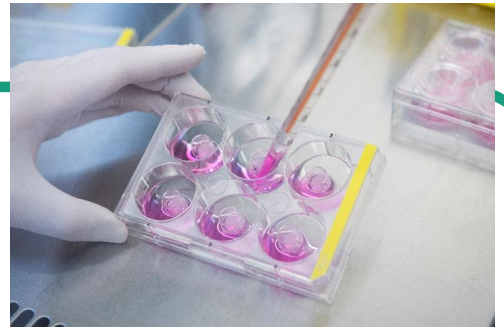
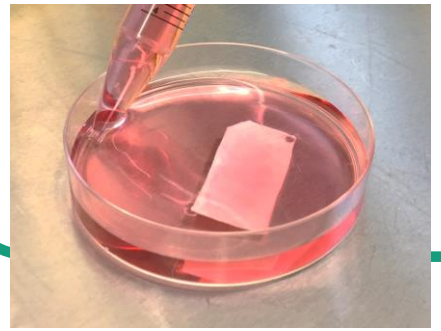
Fraunhofer Institute for Silicate Research ISC, Würzburg
Translational Center Regenerative Therapies TLC-RT

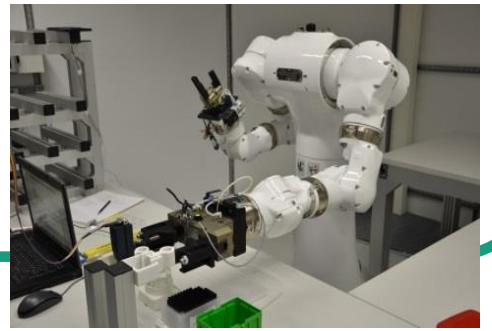
Biomaterials



In-vitro test systems



Clinical development



Lab automation and bioreactors

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Automated Lab at Fraunhofer TLC-RT

HUMAN VS. ROBOT

- Humans are individuals → tendency to repeat actions slightly differently
- Ability to adapt to the surroundings
- Fine-motor skills
- Cognitive skills

- Speed, strength, predictability, repeatability, efficiency, precision and logic
- Increasing reproducibility and accuracy of measurements
- Reduction of the error rate in comparison to manual processes

→
- Process and laboratory equipment is designed for human operates
- Automation requires precision of the production process

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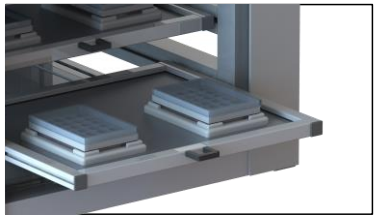
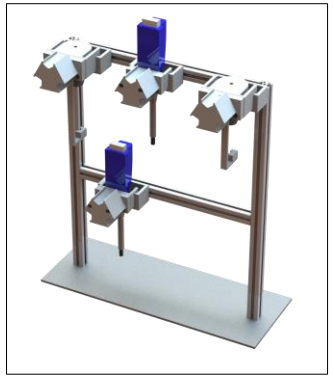
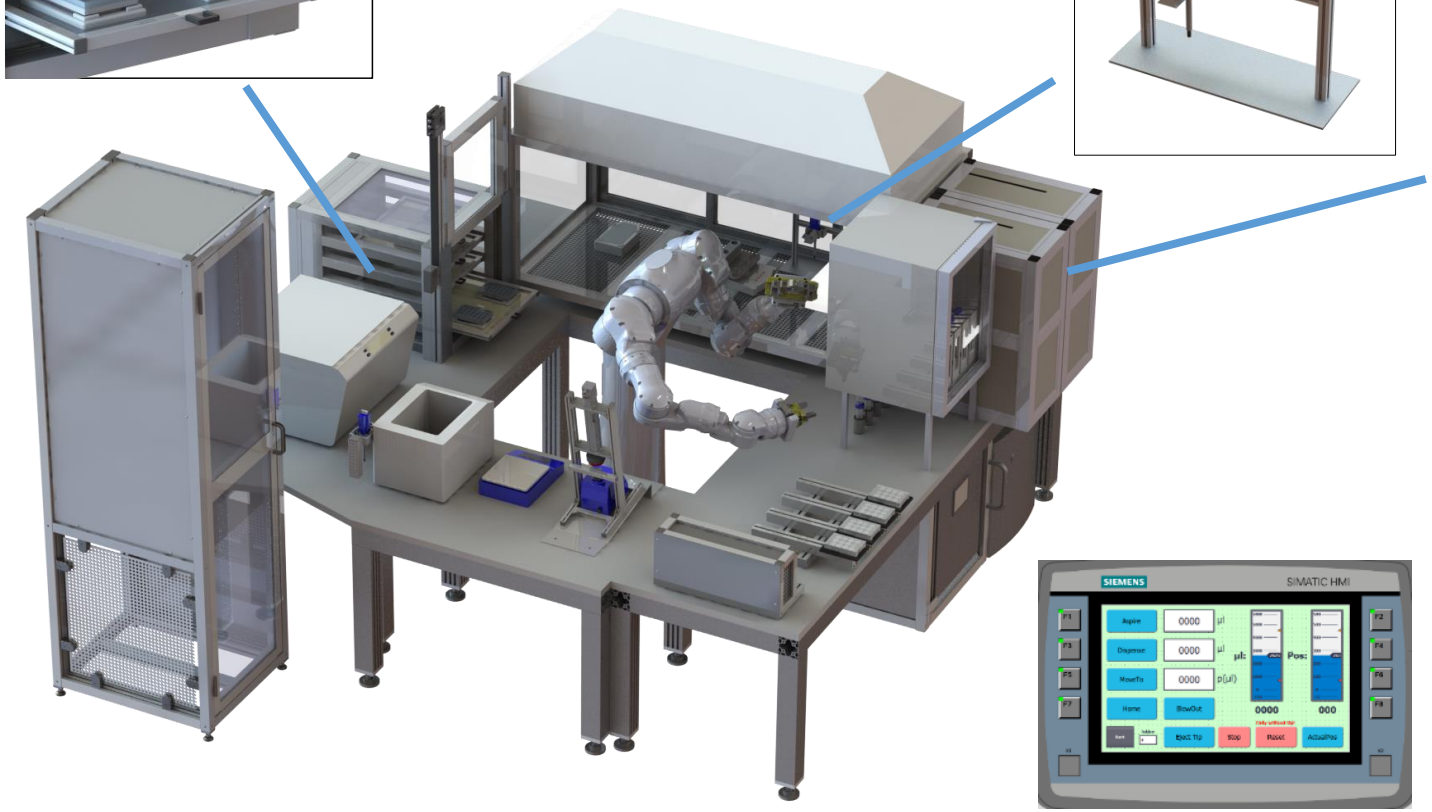
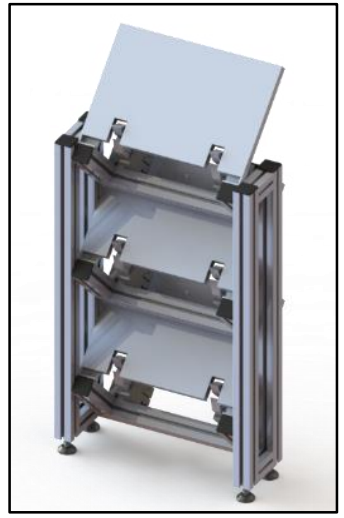
Automated Lab at Fraunhofer TLC-RT
Modular Design









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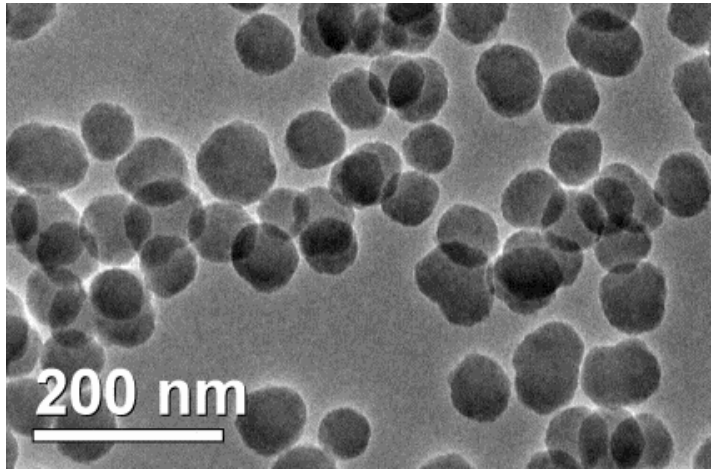
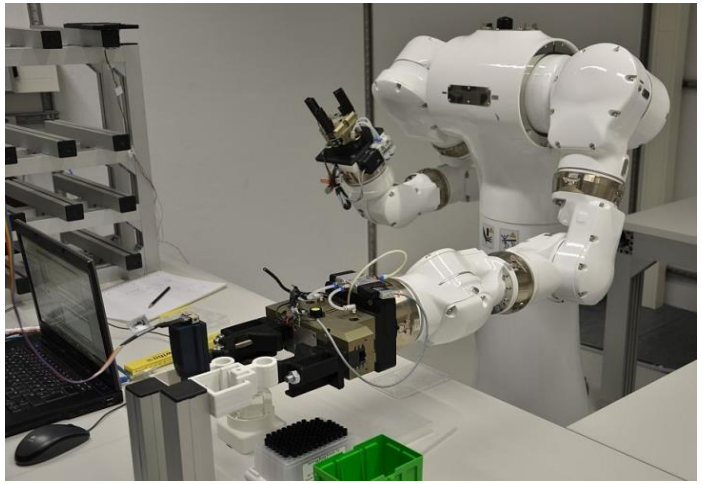
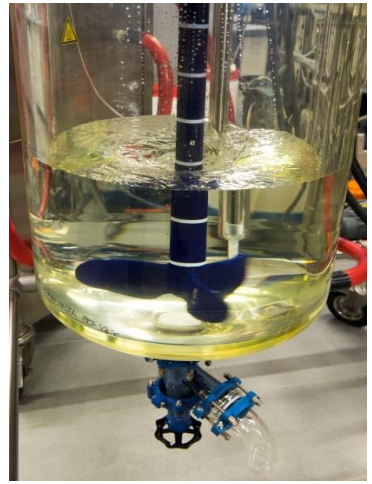
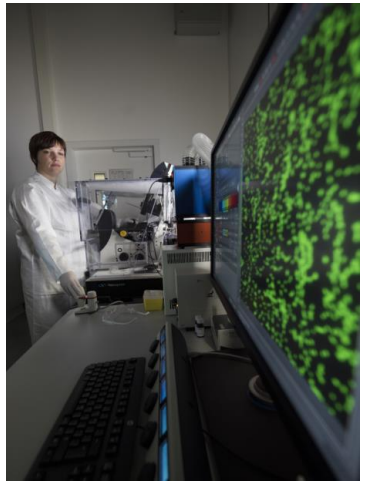
Fields of Activity – (Nano)particles

- (Nano)particle development from profound literature research, feasibility studies and pre-tests to complete prototype manufacturing
- Customized synthesis and surface modification of particle systems
- Upscaling and automatization
- GMP compliant manufacturing
- Biocompatibility and functional testings in human 3D *in vitro* models (alternative for animal studies)









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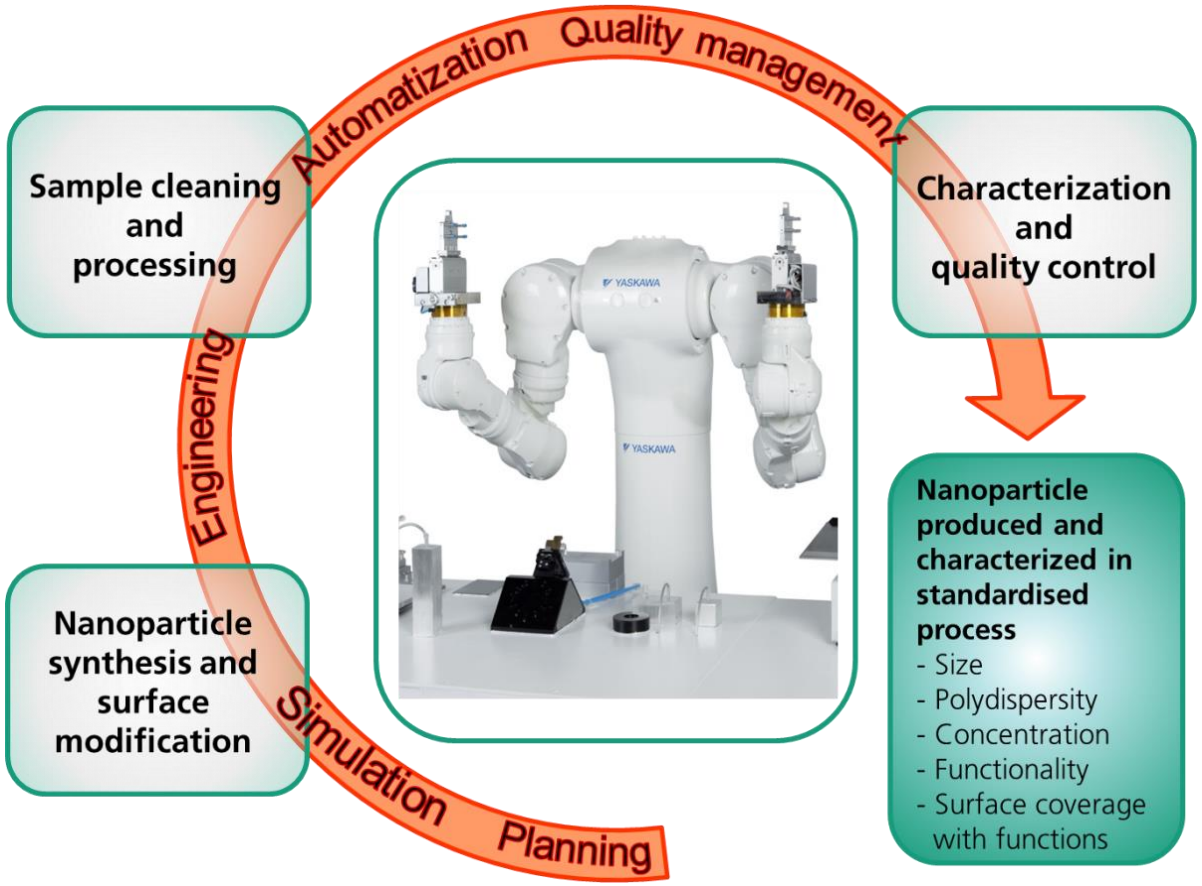
Flexible Robot-based Platform for the Automated Production of Nanoparticles

CURRENT PROJEKT – APRONA



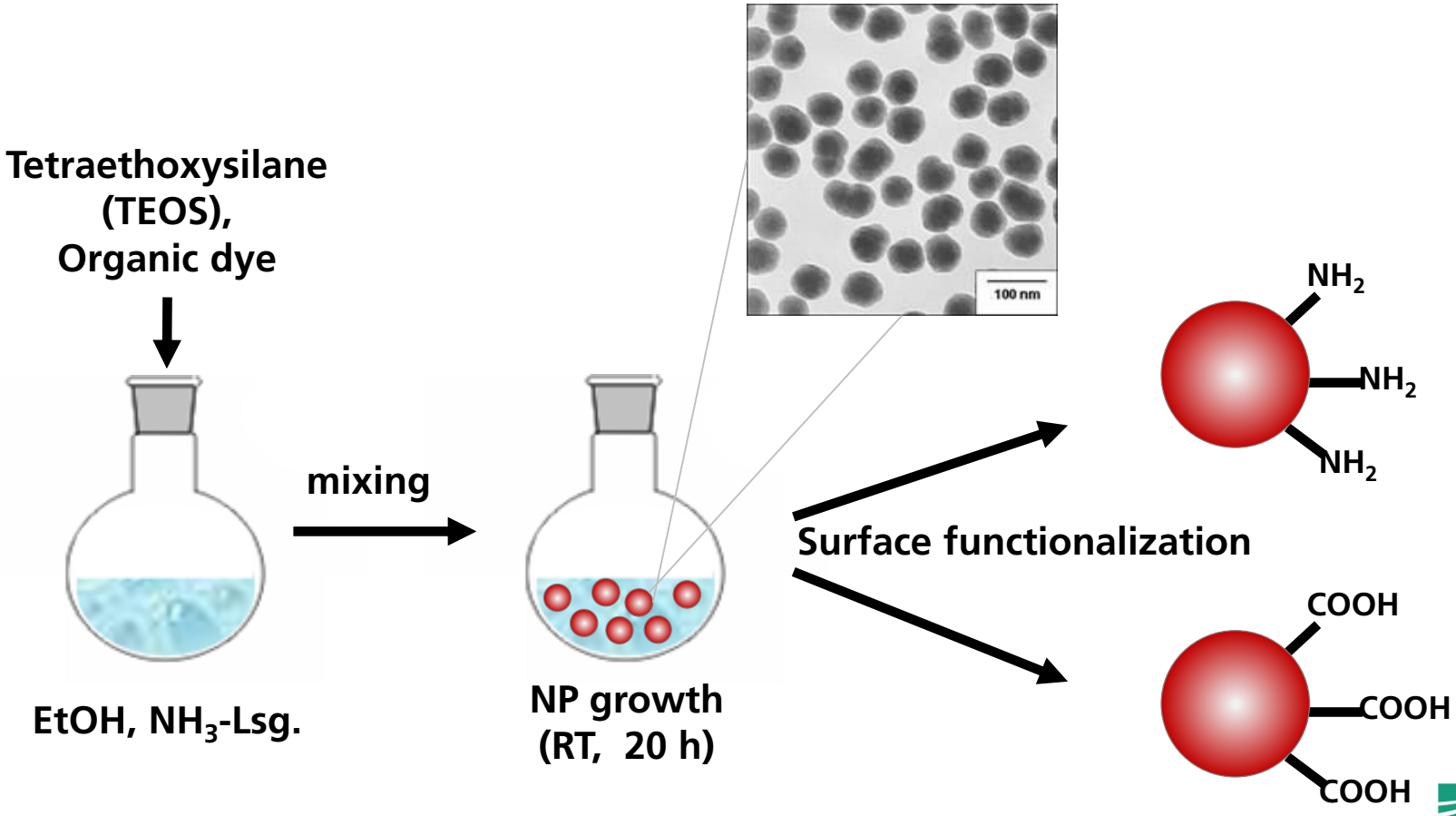
- Funding code 03VNE1049B
- BMBF-funding program KMU-NetC
- Project volume: 1.6 Mio. Euro
- Launch: September 2017
- Duration: 2.5 years

Goldfuß engineering
biametrics biomolecular interaction analysis
BioTeSys
Fraunhofer ISC
BioRegio STERN
KMU-NetC Mittelstand
GEFÖRDERT VOM Bundesministerium für Bildung und Forschung
Fraunhofer ISC

Automated Production of Nanoparticles

aprona

SYNTHESIS OF DYE DOPED SURFACE MODIFIED SIO_2 NANOPARTICLES



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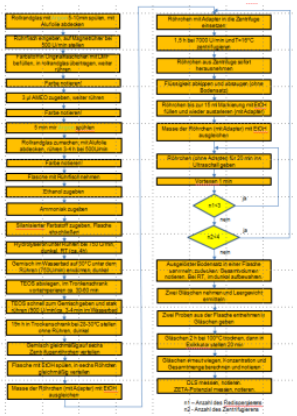
Automated Production of Nanoparticles

aprona

Manual NP synthesis



Documentation and analysis of manual synthesis procedure

Risk management:
- **Risk analysis**
- **Risk assessment**
- **Risk governance**

Process optimisation → automation

Development of quality management system and quality assurance system

Automated NP synthesis

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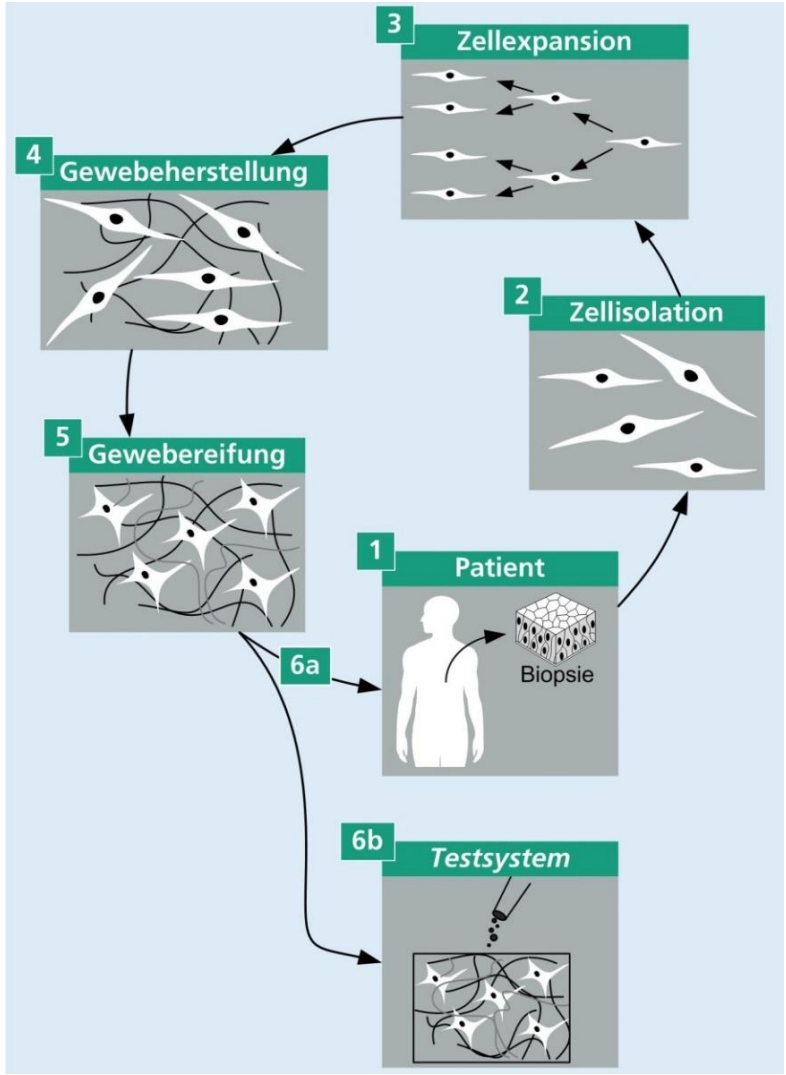
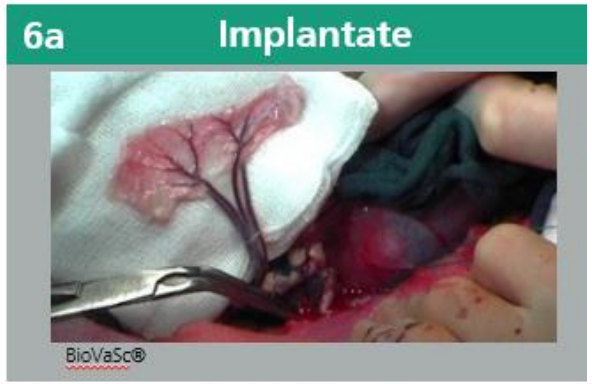
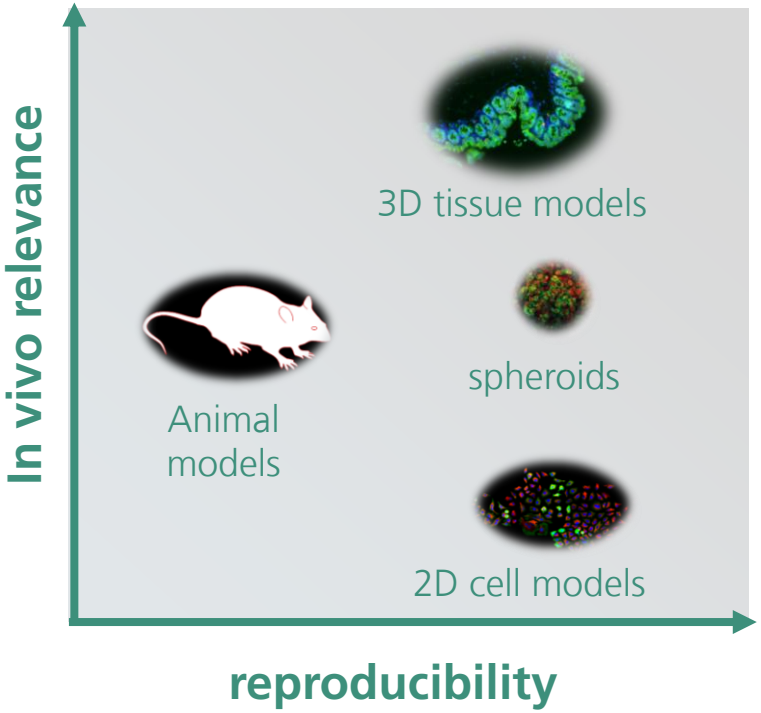
Field of Activity:
In-vitro Tissue Models – Alternative to Animal Studies







- Tissue models as alternatives to animal models
- Higher predictivity
- Reproducible production over years
- More complex models for preclinical studies

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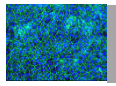
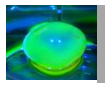
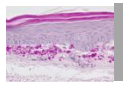
In-vitro Test Systems
Portfolio

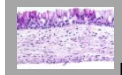
Healthy state

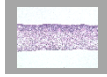

Blood-Brain-Barrier (BBB)


Cornea


Oral mucosa

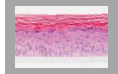
Airway


Trachea

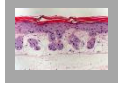

Nasal epithelium

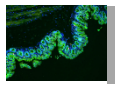

Cartilage

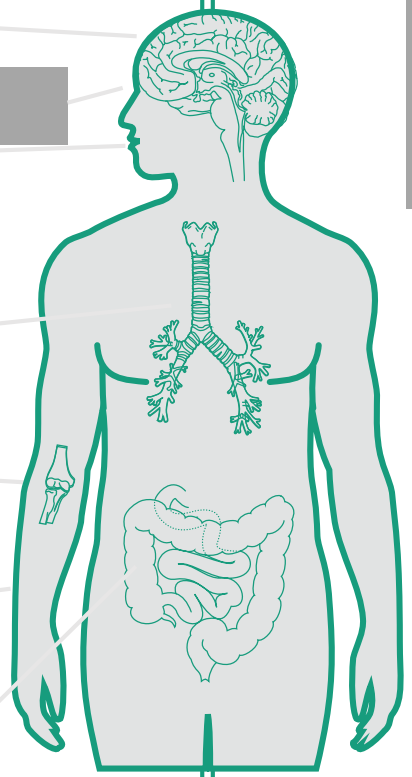
Skin


Epidermis


Full-thickness-skin

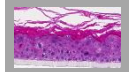

SkinVaSc®


GI-Tract

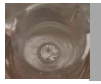


Diseased state

Genetic Diseases


Epidermolysis bullosa simplex

Alzheimer's model of BBB


Wound healing

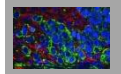
3D INFECT
Infection biology

Oncology


Breast cancer


Lung cancer

Colon carcinoma


Malignant Melanoma

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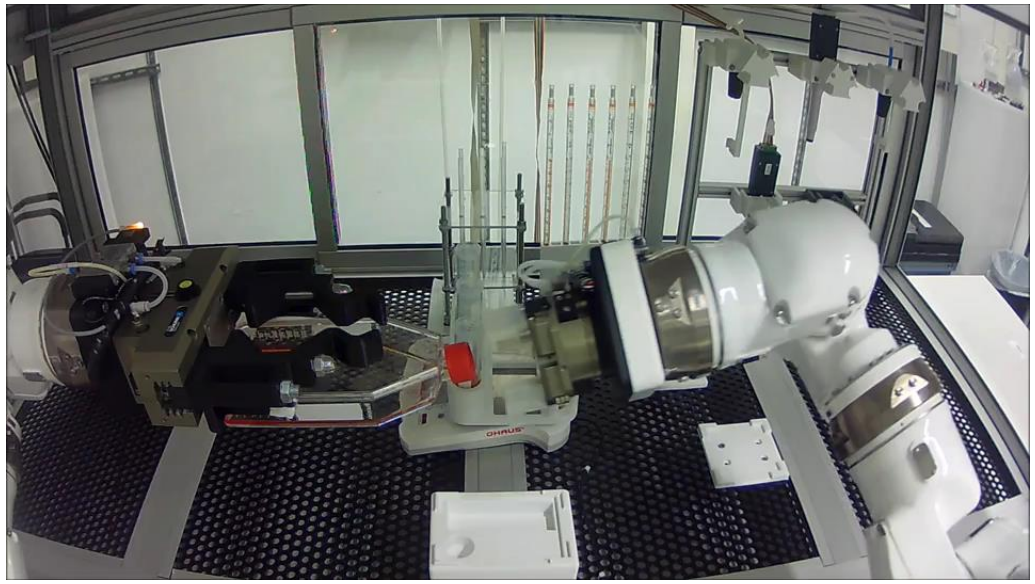

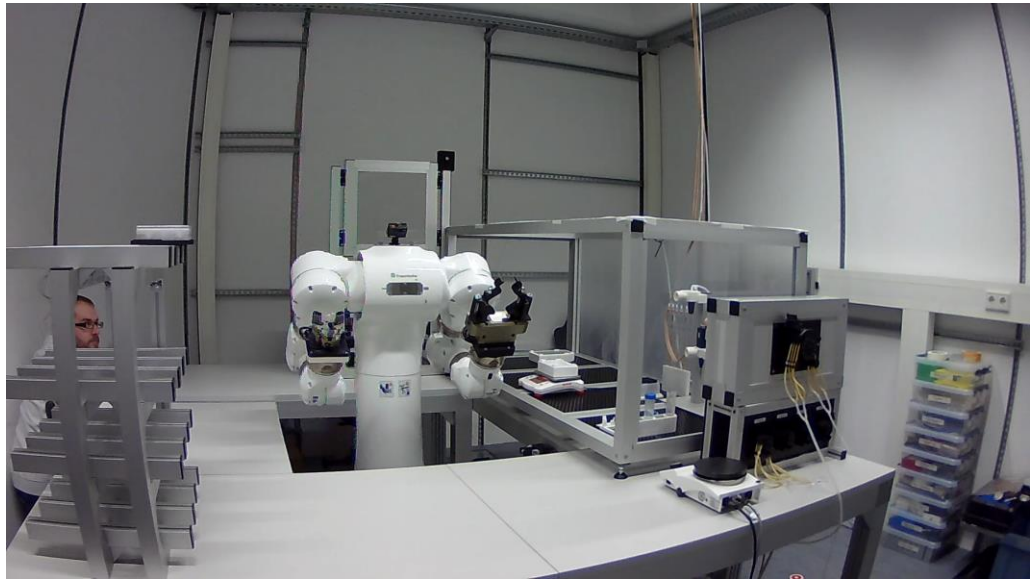

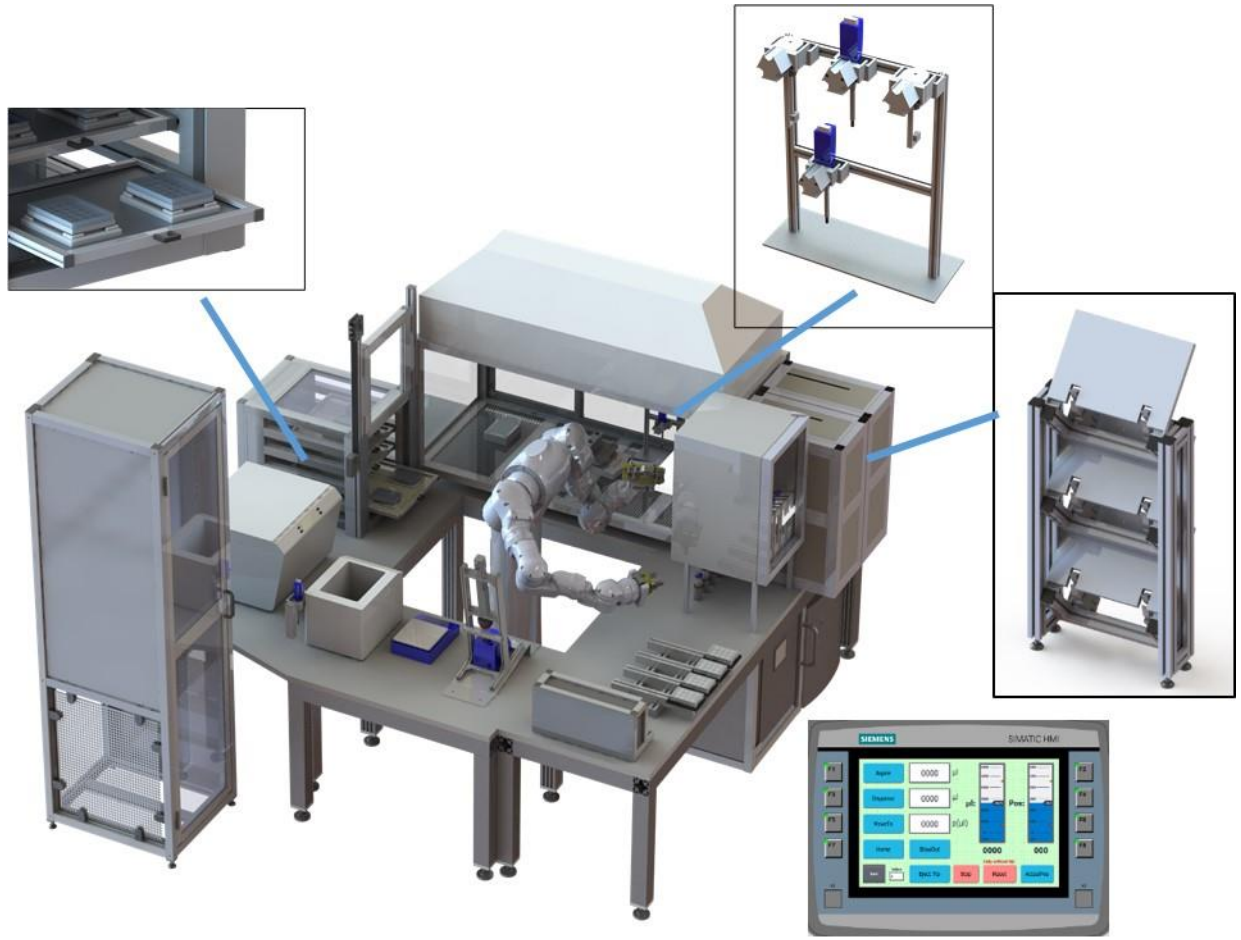

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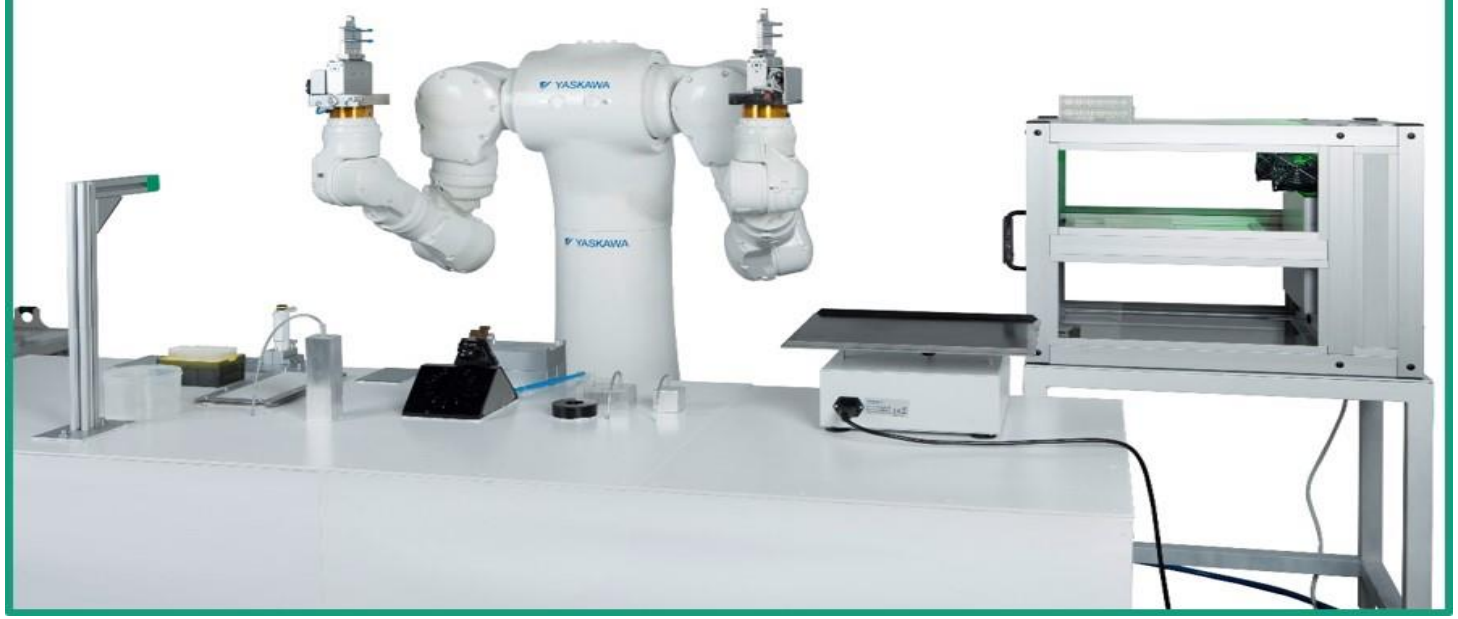
Automation in Endpoint Analysis

Setup



Substance application

MTT assay

Schmid F., Schwarz T., Schuberthan W., Klos M., Walles H**.,** Hansmann J., **Groeber F**.; Automated assessment of the barrier function of in vitro epidermal models using a dual-arm robotic system; Biotechnologie Journal; submitted

YASKAWA Fraunhofer ISC

Our Offer for ICT-46(47)-2020

- Development and manufacturing of synthetic and biologically based materials
- Modular plant design
- Lab automation for cell-based therapies
- Automated production of *in-vitro* testing models and material testing
- Reproducible manufacturing of nanoparticles with narrow defined specifications
  - → Tailor-made products
  - → Production of unique and small scale series
- Precise synthesis steps under GMP-compliant conditions

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Contact:
Dr. Sofia Dembski
Neunerplatz 2, 97082 Würzburg, Germany
Phone +49 (0)931 / 4100-516
sofia.dembski@isc.fraunhofer.de

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ZAHA HADID ARCHITECTS