

Press release

R2R Biofluidics declares war on hospital-acquired infections

Excessive use of antibiotics in human medicine but also in livestock breeding has led to a dramatic increase of drug resistant bacteria in hospitals. Therefore, new and cost-effective tests for the early detection of antibiotic-resistant bacteria are urgently needed. A large number of these tests has to be carried out when developing new drugs to determine the effects of new substances in an early stage of development. Therefore, JOANNEUM RESEARCH is coordinating the collaborative EU project “R2R Biofluidics” which utilizes mini-labs made from micro- and nanostructured polymers to detect life-threatening bacteria swiftly and thus enables better targeted treatments.

Graz, April 2015: State-of-the-art micro- and nanotechnology will help to effectively deal with dangerous resistant hospital germs. The focus is set on the rapid and cost-effective detection of life-threatening bacteria, mostly methicillin-resistant *Staphylococcus aureus*, or MRSA for short. The basic problem of these drug-resistant germs stems from the excessive use of antibiotics, not only in human medicine but also in livestock breeding. MRSA bacteria can cause serious infections which can no longer be effectively treated with most antibiotics. Approximately 30% of all people carry certain MRSA-strains either on the skin or in the nose without triggering any symptoms in healthy individuals. However, in people with a weakened immune system, for example in hospitalised patients, MRSA bacteria may very well lead to serious problems. A cost-effective test to detect MRSA is urgently needed because approximately 50,000 deaths per year are caused by this type of infection in the EU.

Medical device manufacturers in the in-vitro diagnostics sector are interested in micro- and nanostructured polymers for future bio-analytical equipment to detect such life-threatening bacteria. These structured polymers could also be used for many other diagnostic tests (lab-on-chip) by using cost-effective and large-scale production processes. This specific challenge is the focus of the collaborative EU H2020 project “R2R Biofluidics”, which is being

coordinated by JOANNEUM RESEARCH and conducted jointly with nine other research and industry partners. “Biofluidics” in this context means the use of microfluidics (the science of behaviour of fluids in very small volumes) for bio-analytical applications.

It is possible to manufacture highly cost-effective and large-scale sheets of flexible polymer film with extremely precise structures on a micro- and nanoscale by using roll-to-roll (R2R) printing technology. MATERIALS - The Institute for Surface Technologies and Photonics at JOANNEUM RESEARCH - has developed such a roll-to-roll UV nanoimprint lithography unit, which is absolutely unique in Europe. The R2R process which is similar to modern newspaper printing, allows large-scale production of functional microfluidic structures, thus dramatically reducing the unit price.

In the “R2R Biofluidics” project, two demonstrators will be developed in the next four years. First, an in-vitro diagnostic system to identify antibiotic-resistant bacteria will be developed based on microfluidics and nanoimprint technologies. Microfluidics makes these diagnostic tests very straight forward and fast. Besides that, additional optical nanostructures will allow the detection of bacteria at much lower concentrations. A second demonstrator is targeting an in-vitro test method which is of considerable interest for the development of new active pharmaceutical substances in drugs. Nerve cells will be fixed to a structured substrate and the modified surface is used to induce a predefined and structured growth, thus allowing the precise determination of the effect of potential drugs on these immobilised cells.

The project network brings together SMEs, industry partners and research institutions. JOANNEUM RESEARCH MATERIALS is coordinating the EU project “R2R Biofluidics”, which has been allocated a total budget of around 7.9 million euros.

JOANNEUM RESEARCH Forschungsgesellschaft mbH is a leading international research organisation that develops solutions and technologies for businesses and industry covering a wide range of sectors. As an INNOVATION COMPANY focused on applied research and technology development, it plays a key role in facilitating the transfer of technology and knowledge in Styria.

MATERIALS – the research topics of the Institute for Surface Technologies and Photonics are micro- and nanostructuring, light and optical technologies, laser processing, sensor systems and functional surfaces.

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Facts & Figures

- Horizon 2020: The EU Programme for Research and Innovation

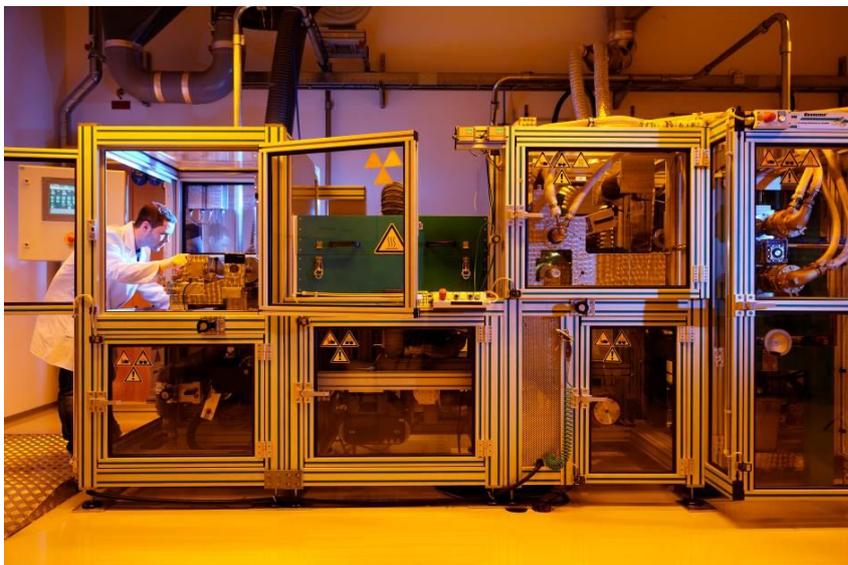
Almost 80 billion euros of funding will be available for research and innovation at EU level between 2014 and 2020. The financing and funding forms range from basic research to innovative product development. The key target groups of Horizon 2020 include individual researchers, enterprises and collaborations between science and industry.

- “R2R Biofluidics” is a project (Innovation Action) under call NMP-04-2014: High-definition printing of multifunctional materials. The H2020 project is coordinated by JOANNEUM RESEARCH (Austria).

In a first step, **bionic surface technologies GmbH (Austria)** will carry out simulations of the fluidic microstructures, while JOANNEUM RESEARCH will simulate the optical nanostructures. **micro resist technology GmbH (Germany)** will develop and produce special photoresists for nanoimprint lithography. The simulated structures will then be produced by the MATERIALS Institute for Surface Technologies and Photonics of JOANNEUM RESEARCH and by **Inmold Biosystems A/S (Denmark)** using an R2R process. **Fundacion Tecnalia Research & Innovation (Spain)** will mainly focus on the surface modification and biofunctionalisation of the structured polymer surfaces. The **EV Group (Austria)** will develop an R2R production facility to manufacture the two demonstrators. **BiFlow Systems GmbH (Germany)** will be responsible for additional processing steps in a pilot production line and the integration of actuators (micropumps and valves). **Greiner Bio-One Diagnostics GmbH (Austria)** and **Innovative Technologies in Biological Systems S.L. (Spain)** will design and evaluate the diagnostic and cell test systems, respectively. **BioNanoNet Forschungsgesellschaft mbH (Austria)** will be responsible for the administrative management of the project and for all safety relevant issues related to nanotechnology.

- The project was launched in February 2015 and will run for 4 years.
- Project volume: € 7.929.411
- Maximum EU contribution: € 6.421.672,57

- The “R2R Biofluidics” project aims to develop bioanalytical measuring instruments based on microfluidic and nanoimprint technologies using roll-to-roll processes. The new devices will enable more precise measurements, lower detection limits and more cost-effective analytical systems.
- The MATERIALS Institute for Surface Technologies and Photonics of JOANNEUM RESEARCH has the only roll-to-roll pilot facility for UV and thermal nanoimprint lithography in Europe.
- Link: www.r2r-biofluidics.eu



Credit JOANNEUM RESEARCH/Bernhard Bergmann, UV nanoimprint lithography unit in the new lab building of JOANNEUM RESEARCH W.E.I.Z. IV.

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