



PROJECT EXAMPLE: EUROPEAN BANK FOR INDUCED PLURIPOTENT STEM CELLS – EBISC

Starting situation

One recent major breakthrough in the biomedical field was the discovery of induced pluripotency. Induced pluripotent stem cells (iPSCs) are not only a great hope in the field of regenerative medicine, but are also the perfect experimental system for cell-based screenings. This is due to i) the lack of ethical concerns, ii) the ease of generation (e. g. from a skin biopsy using non-integrating expression systems) and iii) their extraordinary differentiation potential, which opens the door to a whole array of tests. Not by chance, the pharmaceutical industry has recognized these cells as the ultimate test system, as they can be derived from healthy and diseased donors, reflecting specific clinical conditions in vitro (i. e. cellular features, genetic mutations). Moreover, human iPSCs are the gateway towards the personalization of therapies, where the most effective treatment is tested first on patient-derived cells/organoids and then transposed to the patient itself.

Tasks

However, the generation, expansion and cryopreservation of hiPCs are currently very time-consuming and labour-intensive. Therefore, together with international partners from both academia and industry and supported by EU funding (IMI-FP7), Fraunhofer IBMT is building up a collection of more than 50 human iPSC lines, to be used by both pharmaceutical companies and academic centres. The Pluripotency & Regeneration Group is in the front line for the development of automation strategies for the generation, expansion and cryobanking of these cells. Beside the parallel manipulation of patient-specific iPS cell lines and their expansion, a careful quality control (QC) is imperative. Therefore, QC - and its automation - is one of the priorities of the Pluripotency & Regeneration Group.

Solution

Image recognition programs, robotic systems and the programming of accurate scripts, allow the generation and selection of the hiP cells for maximum quality, with the possibility of executing the complete process under fully controlled and standardized conditions (GCLP). Applying state-of-the-art methods from cell biology, molecular biology and biochemistry ensures a prototypical production line for the constant generation of highly valuable material for pharmaceutical and medical research, setting the stage for future therapeutic use.

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1 Automated, ice-free biobank with closed cold chain (Askion GmbH) installed at the EBISC mirror facility in Sulzbach. (Photo: Bernd Müller).

2 Human induced pluripotent stem cells cultivated on alginate microcarriers coated with vitronectin in a suspension bioreactor with low shear forces (BioLevigator™).