Technology Update

Bio printed Hearts: Still Long way to achieve

Printing Technique: Different methods allow the development of living tissues. These however failed all functioning organs in original size previously. Either they are not precise or very slow. Living tissues to print is sample and favourable. Here is the prescription. To begin with one takes care for a small syringe (injection) including a tubule costing maximum a pair of Euro in the medicine shop (Pharmacy). In its retort a biopolymer is filled. It lends the end product the required form and strength (dose). As for example it is well suited in human. 5ml of that is available online for about 150∈. Now there is still deficiency of ingradient the vital cells. Also one can find these in internet. A deep frozen starter set for lung tissues cost as for example 595∈. One who wants gets also cancerous material totally without additional cost. After that the sample is carefully thawed out. It is blended with biopolymer.

Now the temperature goes up with 37°C the cells feel the best. Also the light is important. The bio ink requires definite wave lengths in order to be hardened. One UV Lamp performs here good service.

Now the mixture is injected in layers on a plate. After each layer the work should be illuminated till it has attained its expected form. Now it requires some patience till the cells have overgrown the form. Now mini lung is ready.

Added in the practice is the process control distinctly complicated. However in the theory the bio-printing functions exactly, so. In each case when as per pneumatic injection extrusion is printed. One of the leading manufacturers of the corresponding instrument is the Sweden based firm Cell Link. Its top seller is named BioX. The printer arranges on three similar easily heated extructor syringes a tempered construction platform, a highly efficient filter plant different ultraviolet light emitter as also one integrated computer which controls and

ORCID: Anil Kumar Ghosh: https://orcid.org/0000-0002 -8833-8676

supervise tissue printing. It costs an amount of 35000∈. Optionally available there are different bio inks out of which heart, skin, cartilage and bonny tissue are generated. These are used for pharmacological research and for experimentation (investigation) of new hormones/vitamins.

The functioning organs cannot be manufactured by the BioX. The positioning and dose exactness is much too small in order to integrate a receptacle system in the printed tissue. But exactly it requires the few vein plexus in order to look after (take care / nurse) the cells durable with all first aids, what they need for life.

Essentially detailed print result allows the stereo lithography (SLA) method. With that serous (aqueous) bio inks are integrated into the ready cell and in layers in gelatinous parts transformed. The medium gets to photo polymerisation. The original material consolidates there everywhere where it meets with light.

The Cell bricks GmbH belongs to the outrider in Bio printing. The Berlin Company has come up with already the analysis in the area of 10µm. He does not advise how the young scientists do that. They are open and clear however when it goes to over bidded expectations. "It will still last for decades till the functioning organs can be printed" underscores biotechnologist, Alexander Thomas. Still hourly technical hurdles up on the way in the goal, heart, kidney, lung, lever, Lunge & Co put together (Compose) dozens of different cell types. They all have targetted to bring to the right place but is extremely difficult. In addition to that the biological structures are very finely built. So the capillaries have diameter of 5µm to 10µm.

In theory both these hurdles thus big cell multiplicity and fine organ structure get overcome. Surely the printing of a unique organ would last several hours or days together. Many cells could not survive that. The suggested theory is in spite of that interesting. It is based on two methods: Two photon induced polymerisation (TPP) and laser Induced Forward Transfer (LIFT).

With TRP method the fluid light sensitive material becomes only in focus volumes of laser ray hardened out because the polymerisation process is not dose dependent but performance dependent. In this manner structure get developed, the new diameter becomes less than 0.5µm.

With the LIFT method the extremely fine frame as per the exact target with the right cells could be filled up. Co-developer Martin Wehner of the Fraunhofer Institute for laser technology (ILT) explains how that functions "On the target layer there is a glass object carrier with which the carried over biomaterial on the underside and to one intermediately located absorbing layer. Through a pulsating laser ray the absorbing layer is evaporated and cells are carried on to the sub layer owing to the so caused onward impulse.

Surprisingly according to the turning up process parameters up to 95% of the cells survive and dissociate. The method is so precise that the individual cells out of their cell composite released out and can be carried over.

Anil Kumar Ghosh

Ref: VDI nachrichten, 7 Juni 2019.
Nr 23 Seite 22 FOKUS: BIO PRINTING