INFORMATION ABOUT GLIOMATRIX™

v1.0 Dec 2023

Astroglial Innovations is a purpose-built medical company developing technology for neuroregeneration of the damaged spinal cord. By offering a therapeutic solution for reconstruction of completely severed spinal cord based on advanced tissue engineering product Gliomatrix™, we are dedicated to translate scientific discoveries into tangible benefits for patients, striving to improve and restore motor and sensory functions, reduce pain, and enhance the overall condition and quality of life for those in need.

Our therapy is based on the unique properties of olfactory ensheathing cells (OECs) which allow them to interact with host spinal cord astrocytes, leading to opening of the astrocytic barrier and allowing for central axon elongation.
OECs and olfactory nerve fibroblasts (ONFs) can attract and guide the regrowing axons to their target neuronal populations. This unique neurotrophic activity of OECs, the miracle cells from the central nervous system, has been described in hundreds of scientific papers in the last four decades.

The ATMP-HE Gliomatrix™ product is a mixed culture consisting of human olfactory ensheathing cells with fibroblasts growing in a three-dimensional collagen matrix, prepared in a strictly controlled fashion and under Good Manufacturing Practice requirements in a dedicated laboratory facility, with highest quality and cleanliness standards.
The European Medicines Agency (EMA), in response to our team's inquiry in 2018, classified such collagen co-culture as a tissue engineering product intended for the treatment of total spinal cord injuries in humans.

The starting material to produce ATMP-HE (advanced therapy medicinal product - hospital exemption) Gliomatrix™ is brain tissue in the form of an olfactory bulb collected from a patient during a neurosurgical procedure. Those cells are then co-cultured in the 3D matrix *in vitro*. Next, Gliomatrix™ is administered to the site of the spinal cord injury in the subsequent medical procedure. The transplant initiates the process of rebuilding of functional connections between axons located above and below the site of injury.

The expected result of Gliomatrix™ use in patients is regaining motor and sensory function, which – combined with a proprietary rehabilitation program – would allow them to significantly improve their physical activity and quality of life.

Research on animal model of spinal injury prove that the administration of a co-culture of olfactory glial cells with fibroblasts from the olfactory bulb in the collagen matrix to the site of the injury restores the continuity of the long tracts of the spinal cord and restores their functionality. Our own research using co-cultures of olfactory glia with fibroblasts from the olfactory bulb resulted in a significant return of neurological functions in a human patient with a complete disruption of the spinal cord.

The technology of cell preparation for transplantation and the spinal cord reconstruction surgery was developed by a team led by prof. Pawel Tabakow and dr. Wojciech Fortuna, in cooperation with Neurorepair Unit of the Institute of Neurology, UCL, led first by prof. Geoffrey Raisman, and recently by prof. Ying Li. This team has spent the last dozen years refining the neurosurgical and biotechnological aspects of the method, which is ready to be used in clinical practice.

While developing the Gliomatrix™ product the team of prof. Tabakow and dr. Fortuna has already successfully performed spinal reconstruction surgery using technology in its first, prototype version. After the procedure, a paralyzed patient with a completely severed spinal cord – Mr. Dariusz Fidyka – showed significant improvement in sensation, voluntary movements and control over physiological and sexual functions.

The results of these studies were published in 2014.

Tabakow P. *et al.* **"Functional regeneration of supraspinal connections in a patient with transected spinal cord following transplantation of bulbar olfactory ensheathing cells with peripheral nerve bridging"** Cell Transplant. 2014; 23(12): 1631-1655.

Currently, Astroglial Innovations intends to use the Gliomatrix™ product for spinal reconstruction therapy in accordance with the EMA CAT qualification for the treatment of total spinal cord injuries in humans in the ATMP-HE mode according to Polish legislation. Next, our goal will be a clinical trial and registration of the ATMP Gliomatrix™ product in a central procedure at the EMA. In the future, we plan to expand the indications for the use of the product, e.g. to include the treatment of incomplete spinal cord injuries and potentially other diseases.

Selected literature in the field

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