

Fetal Stem Cell Treatment for Autism

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Abstract

Autism spectrum disorders (ASDs) are heterogeneous complex neurodevelopmental pathologies defined by behavioral symptoms, but which have well-characterized genetic, immunological, and physiological comorbidities. Despite extensive research efforts, there are presently no agreed upon therapeutic approaches for either the core behaviors or the associated comorbidities. In particular, the known autoimmune disorders associated with autism are appealing targets for potential stem cell therapeutics. Of the various stem cell populations, fetal stem cells (FSCs) offer the potent immunoregulatory functions found in primordial mesenchymal stem cells, while exhibiting rapid expansion capacity and recognized plasticity. These properties enhance their potential for clinical use. Furthermore, FSCs are potent and implantable "biopharmacies" capable of delivering trophic signals to the host, which could influence brain development.

Keywords: Autism; treatment; stem cell

Unfortunately, the cases with autism in kids tremendously increased during the recent years. For instance, in 2000 spreading of autism recorded from 5 to 26 cases per 10 thousand of children population (due to the data of WHO). In 2020, the Center for Control and Prevention of Diseases in the USA published the newest statistic on autistic spectrum disorders (ASDs) as diseases which usually occur in each 54th kid - that is, exceeding the statistic results for 2018 by 10 % [1, 4].

Nowadays, 1-3% of all kids over the planet have been diagnosed with autism.

This makes such a problem really essential and requires investigations for developing contemporary methods of psychological, social and structural correction for this pathology [4, 5].

The sooner autism is diagnosed and the earlier rehabilitation we begin, the higher chances for prevention of ASD disease lay over the kid's mind are [2].

How do we treat children with ASDs?

The next options are used as treatment in ASD children:

1. Neuropsychological correction.
2. Psychotherapy.
3. Social therapeutic training (treatment pedagogic, medical physical training, classes in musical rhythmic, occupational therapy, social work with family and kid).
4. Physiotherapy.
5. Learning.
6. Speech therapy.
7. Occupational therapy.
8. Chelation.
9. Treatment with medicines.
10. Diet therapy.
11. Animal-assisted therapy.

Nowadays, stem cells are increasingly used all over the world in treatment of autistic kids. If stem cell therapy performed when kid's brain is still growing that might be guarantee of successful development of children with ASDs [3, 8].

EmCell clinic has been performing treatment for autistic kids since over 20 years. Our clinic staff together with prominent specialists in autism therapy from the other countries (the USA, Italy) made their scientific research on effectiveness of treatment in autistic kids by use of fetal stem cells (FSCs). Results of all our studies were published in the scientific journals [5].

Clinic staff achieved much clinical experience in treatment of children with different ASDs by use of FSCs. The doctors use FSCs suspensions which contain various types of multipotent stem cells and harvested from 9-12 weeks gestation human fetuses. Personalized treatment is selected per each individual case. Standard option of FSCs therapy suggests 2 days program for autism treatment. In a process of treatment, child receives several types of stem cells with the main role assigned to pre-neuronal cells. During the first day of therapy, stem cell suspensions are used in drip-feed intravenous infusions. On the second day doctors inject stem cells subcutaneously into abdominal wall (for gradual, slower releasing of stem cells into systemic blood circulation, preparing the "depot" of cells and making their clinical effect longer). During the second day of therapy, session with hyperbaric oxygenation (HBO) is also performed for the kids. HBO improves blood oxygenation and positively influences all metabolic processes, in particular, it contributes to better cells engraftment, differentiation and cell reproduction.

What is the mechanism of stem cells influence on ASDs (autism, Asperger's syndrome etc.)?

There are several hypotheses regarding the effects of stem cells:

- Replacement of damaged cells with healthy stem cells;
- Stimulation of affected cells to regeneration (recovery);
- Activation of different growth factors.

Stem cell suspension contains lots of biologically active substances, cytokines, neurotrophic growth factors like NGF, BDNF, ciliary neurotrophic factor (CNTF) and GDNF, which trigger activation of proper biologically active substances in the body [8].

Administration of fetal stem cells helps with targeted influence on brain functional structures; this contributes to restoration of balance within brain neurotransmission systems which, as a result of synthesis of neuromediators, improve neurons transmitting throughout the axons for recovery of conductivity by nervous impulses via still existing nerve filaments. As a result, pathological process is diminished, neurology functions might be restored, kid's psychology deficits are reduced, whereas cognitive functions improved. In addition, life quality and social adaptation in autistic kids much increase too.

FSCs effects in autistic children were as follows:

1. Cognitive improvements.
2. Easier contact with the child (eye contact, first of all).
3. Improvement of verbal skills (if the child is non-verbal, s/he is very likely to start making sounds, syllables, and then pronounce words; bigger vocabulary in verbal children).
4. Learning capacity improvement.
5. More adequate behavior, assiduity and patience.
6. Improvement of information memorization, processing and storage, better recall of information received.
7. Psychological confidence improvement (children feel much more protected, less vulnerable, and exposure to the environment does not cause negative emotions) which were remarkable prior to therapy.
8. Social adaptation improvement.
9. Self-care skills improvement.
10. Gastrointestinal functioning improvement.
11. Immune boosting.



There are signs of several effective mechanisms involved following FSCT, including regeneration of the neural cells, direct stimulation of the neurons, the endogenous stem cells as well as trophic paracrine mediators and neovascularization. Among the potential mechanisms of FSCT effect, the following advantages are registered: neuronal cell replacement, blood vessel regeneration, astrocyte and microglial cells replacement, blockade of splenic release of inflammatory cells and protection of intrinsic cells. One of the principal advantages appropriate to stem cell transplantation in children with perinatally induced developmental delay is that stem cells could replace the cells of damaged CNS. Most scientists working with adult stem cells show only a minimal survival of the cells transplanted with few if any, of such stem cells displaying markers/functionality of nervous tissue [10-12].

Conclusion

The use of FSC is one of the most promising directions in the development of modern medicine. Today, a huge amount of scientific evidence testifies in favor of the effectiveness of the use of FSC in a number of severe diseases of the cardiovascular, nervous, endocrine systems and the musculoskeletal system. There are already thousands of SC transplants in the clinic, and these data are reflected in the leading scientific journals of the world. But, at the same time, there are many questions that require continuation of clinical research [2, 7].

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