Lurcher mutant mice represent a model of olivocerebellar degeneration. They are heterozygots carrying a mutation in the glutamate receptor 52-subunit gene. The receptor malfunction causes excitotoxic apoptosis of Purkinje cells, extinction of which leads to secondary degeneration of cerebellar granule cells and inferior olive neurons. Lurcher mutants suffer from ataxia and deterioration of spatial learning and orientation ability.

The aim of the work was to assess the effect of embryonic cerebellar tissue transplantation and enforced physical activity as well as the effect of their combination on spatial orientation ability in Lurcher mutant mice and to observe cerebellar graft survival in adult and young Lurcher and adult wild type mice.

For the graft survival analysis adult wild type mice and young and adult Lurcher B6CBA mice were used. To study the effect of the transplantation and enforced activity on spatial orientation adult and young Lurchers of the same strain were used. The graft obtained from mouse embryos without the Lurcher mutation was applied into the cerebellar area of the host as solid pieces. Control mice were treated only with vehicle. Enforced activity was represented with repeated rotarod training. Spatial orientation was tested in the Morris maze 9 weeks after the surgery. Histological examination of the graft presence was performed 3, 6 and 9 weeks after the transplantation or after finishing the spatial orientation test.

Significant differences in graft survival neither between adult Lurcher mutant and wild type mice nor between young and adult Lurchers were found. In wild type mice graft sprouting into host tissue was slightly more frequent than in adult Lurchers. In young Lurchers, the cerebellar cortical structure was observed more often in the graft and graft sprouting was more frequent than in adult ones. In any of the experimental groups no evident decrease of frequency of graft presence during the period studied was observed. No effect of the training on graft fate was found. Spatial orientation ability was lower in control Lurchers than in wild type mice. Moreover, adult mutants reached worse results than young ones. Physical activity significantly improved the performance of adult Lurcher mice. The effect of the transplantation was moderate. When combined with the training, the transplantation even decreased its effect. In young Lurcher mice, neither the effect of the transplantation nor the effect of the training on spatial orientation ability were found.

Neither the degenerative affection of the cerebellum of Lurcher mutant mice nor their age influenced survival of the embryonic cerebellar graft but they slightly interfere with its development. Enforced physical activity improved spatial orientation ability only in adult Lurcher mice. The effect of the transplantation was ambiguous.