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Developmental shift of activity-dependent plasticity at VLF-motoneuron synapses: Role of mGluR and postsynaptic cell types.

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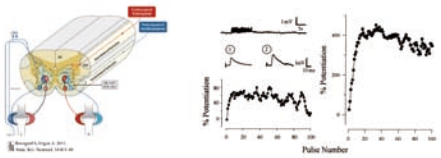
INTRODUCTION.

In 1994, Lev-Tov and Pinco (J. Neurophysiol) showed that the excitatory postsynaptic potentials (EPSPs) induced by the stimulation of the ipsilateral VLF in lumbar motoneurons are potentiated during high frequency stimulations (1-20Hz) in the neonatal rat spinal cord preparation (P1-P6). To further address the activity-dependent synaptic plasticity of the VLF-motoneuron synapses, we investigate the changes in this glutamatergic transmission before and after a tetanic stimulation (50Hz, 2s; frequency of reticulospinal neurons during locomotion in the cat, Matsuyama and Drew 2000) of the VLF axons in mouse spinal cord slices at two different developmental stages (P1-P4 and P8-P12).



MATERIAL and METHODS.

- Postnatal 1 to 4 (P1-P4) and P8-P12 C57Bl6/j mice
- Whole cell recordings from lumbar motoneurons in 350µm thick slices
- Recordings in a strychnine/gabazine/high calcium/high magnesium containing saline

Figure 1
VLF excitatory postsynaptic currents (EPSCs) are linked to the activation of AMPA receptors in both P2-P4 and P8-P12 lumbar motoneurons

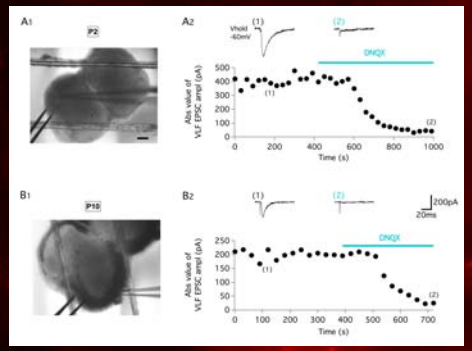


Figure 2
Regardless of the developmental stage, three different types of plasticity could be expressed in VLF motoneuron synapses

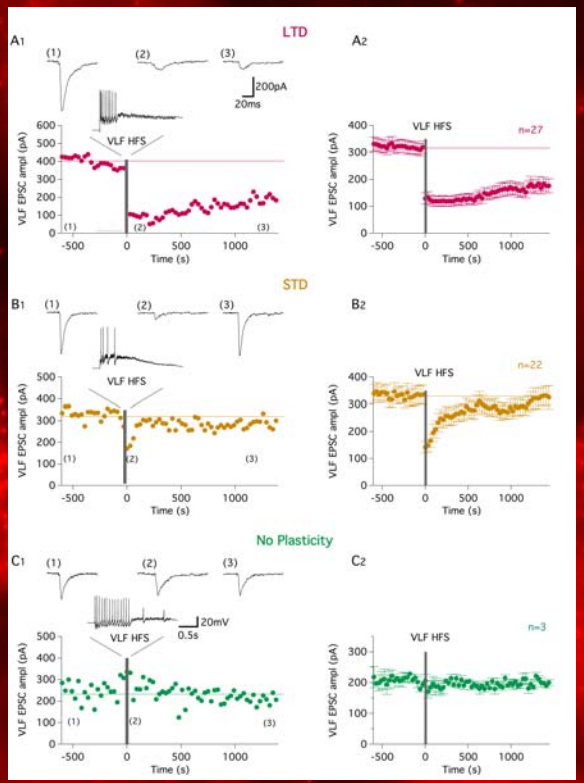


Figure 3
Summary histogram of the percentage of motoneurons expressing LTD, STD or no plasticity for the two developmental stages tested

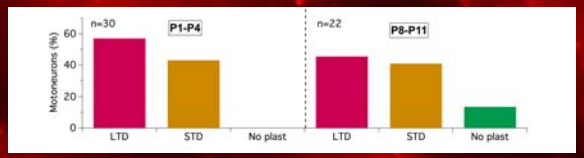


Figure 4
Western blot analysis of the mGlu receptors in the lumbar ventral spinal cord of P2 and P10 mice

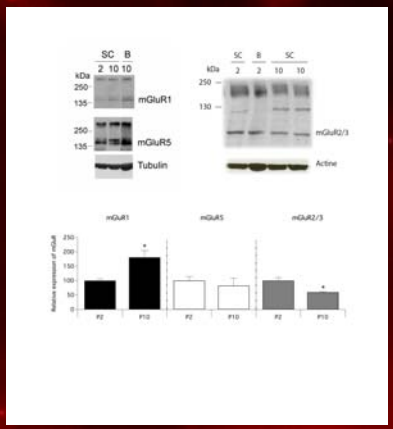


Figure 5
Effect of the mGluR1/mGluR5 agonist DHPG on the expression of plasticity in P1-P4 mice

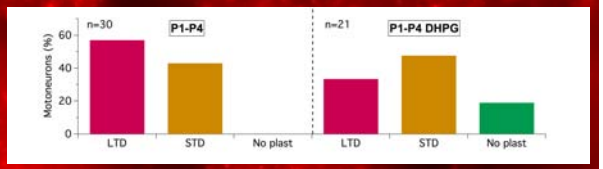
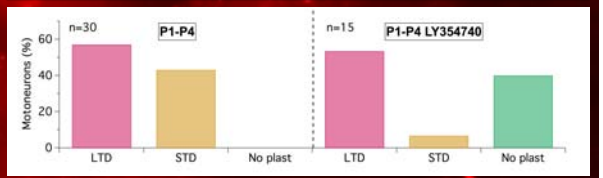


Figure 6
Effect of the mGluR2 agonist LY354740 (5.10^{-7}M) on the expression of plasticity in P1-P4 mice



CONCLUSIONS

The VLF-motoneuron synapses express activity-dependent plasticity after a 50Hz tetanization. This plasticity evolves with the maturation of the synapses and seems at least partly to be linked to the maturation of the mGluRs in the lumbar ventral spinal cord.

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