Reviewer's report

Title: Magnesium administration provokes motor unit survival after sciatic nerve injury in neonatal rats

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Reviewer: Urszula Slawinska

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General
This short paper reports the neuroprotective effect of Mg2+ treatment on motoneurons following the sciatic nerve crush. The authors investigated the muscle contractile properties and the number of motor units (MUs) of two hindlimb muscles (the EDL and Sol) representing the two group muscles (fast and slow) at the ankle joint. They examined carefully the number of MUs and the time course of functional changes after nerve injury in those muscles at three postnatal stages and adulthood in animals of four groups of animals. They concluded that “the motoneuron death occurs mostly within two weeks to (after?) axotomy” (the presented data do not convince the reader in the case of the Sol muscle) and that “EDL was affected by axotomy much more than Sol” (what is in opposite to results obtained in experiments described by others; see Dick et al., 1995 or Sanussi et al., 1998).

This is an interesting set of experiments testing a new approach of magnesium application following nerve injury to rescue motoneurons and their functions that could find clinical application (if it does not induce serious side effects).

Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)

1. I think that experimental approach used in this investigation was not optimal. The investigation of the contractile properties of the Sol muscle should not employ the stimulation of the sciatic nerve in popliteal fossa but its own nerve located just between the Gastrocnemius and Sol muscles. The electrical stimulation of the whole sciatic nerve induces contraction not only of the Sol muscle, but also of other extensor muscles innervated by the same nerve (Gastrocnemius lateralis, medialis and Plantaris) and might be responsible for serious artifacts that were attributed to a Sol muscle contraction. The reader should know how the Authors were able to avoid the force summation during the contraction of the whole group of extensor muscles that are innervated by this nerve and were not denervated when prepared for the final experiment.

2. It is rather critical to present the real data, not only the ratio of one value expressed as a percentage of the other control value. There are lots of papers concerning the sciatic nerve crush performed in young rats. Thus, the presentation of the real value of the muscle weight and the force produced by the muscle in the single twitch or tetanic contraction will give opportunity to see the real effects of the sciatic nerve crush. It is particularly important, because the effects of sciatic nerve crush on muscle properties of fast and slow muscles in this paper differs from that described by others and should be more carefully discussed (see J. Dick et al., 1995). According to the paper by Sanussi (et al., 1998) the motoneurons of the Sol muscle are more sensitive to injury in early stage of development than those of the EDL muscle.

3. When analyzing Fig. 2. one can see that there were not the whole set of frequencies applied in some cases of the tetanic tension investigations (see the bottom panel for EDL or the top panel for Sol where only 4 traces were recorded). Moreover, it is rather doubtful that the stimulation frequency in the particular burst stimulation was carefully monitored during experiments (as example, compare two bottom panels, where at the left 4 stimuli were applied while at the right 3 stimuli were delivered.
In both cases the Authors claim they used 10 Hz stimulation with the same burst duration?

Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

1. Page 4: Was the postnatal day of birth taken as a “zero”?
2. Page 5: It is unclear how many animals were investigated in each experimental group. Since the Authors mentioned the big mortality, were there 6 animals of those that survived in the group of the Mg 2+ treated animals?
3. Page 5: It is unclear how was the plantar- and dorsi- flexion checked? By the animal observation or by making (how?) some manipulations with the animal hindlimbs?
5. Page 6: The kind of abnormal reflexes demonstrated by axotomized rats for about 2 weeks should be described.
6. Page 7: The description of the stimulus used for tetanic contraction investigations is lacking. How long was the burst duration?
7. Page 8: Examples of the single twitch records (new Fig?) that allowed calculating the numbers of motor units in some particular muscles are needed.
8. Page 9-12: Care should be taken to indicate the tables that are described in the results and discussion section. For example, Table 1 is quoted in the wrong place on the page 11. Tables 2, 3, 4, 5 are not quoted.
9. Page 13 and 14: There are inadequate places for the quotations of the [22] paper. In this paper no contractile properties of the immature muscle and no the effects on motoneuron death were investigated
10. page 13: The authors write in the discussion concerning the fatigability of slow Sol muscles that: “...if axotomy is performed this process is being reversed”. It seems that this process might be stopped but not reversed. There is considerable doubt why the muscle innervated by smaller number of motor units is not fatigue resistance any longer (see other papers)?
11. Page 15: It is inadequate place for the quotation of the [16] paper. In this paper, MK-801 treatment only was investigated and discussed. Probably the Authors wanted to quote paper [10].

Discretionary Revisions (which the author can choose to ignore)

12. Page 4: Maybe the Authors should discuss the developmental changes in the blood-brain barrier control of magnesium entry, particularly that in the quoted paper [10] the problem is pointed as unclear.

What next?: Unable to decide on acceptance or rejection until the authors have responded to the major compulsory revisions

Level of interest: An article of importance in its field

Quality of written English: Needs some language corrections before being published

Statistical review: No

Declaration of competing interests:
None