The 1.28 ppm biomarker: not specific for neural progenitor cells, but also in the mesenchymal stem cells and differentiated adipocytes measured by NMR spectroscopy

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BACKGROUND: NMR-visible mobile lipid (ML), the 1.28 parts per million (ppm) biomarker, which was thought to be arisen from mobile lipid droplets formed in the cells[1], has been considered as unique for the neural progenitor cells (NPCs)[2]. Scientists are trying to explore the specific biomarker of the stem cells, as a promising work to trace the cells after transplantation by MR spectroscopy.

OBJECTIVE: The aim of the present study was to determine whether the 1.28 ppm biomarker also resides in other kinds of stem cells and non-stem cells, and to approach this biomarker changes with adipogenic differentiation, meanwhile to study the relationship of the 1.28 ppm biomarker with mobile lipid droplets.

METHODS: The 1H NMR spectroscopy of the CE109 cells, mesenchymal stem cells (MSCs) and its adipogenic cells were performed in the study(Fig. 1). When the CE109 cells and MSCs grew up to 80-85% confluence, at passage 4, they were used for spectroscopy analysis with perchloric acid (PCA) extraction, and measured by in vitro 9.4T NMR spectroscopy. After about two weeks adipogenic differentiation[3], the Red-O staining and RT-PCR were needed for the lipid droplets demonstration and adipogenic differentiation identification(Fig. 1, 2).

RESULTS: Our 1H NMR experiments demonstrated that the 1.28 ppm biomarker was observed in human MSCs without growth-arrested, but absent in the EC109 cells. After adipogenic differentiation induced for 2 weeks, the 1.28 ppm biomarker climbed, remarkably, with the mobile lipid droplets generation(Fig. 1, 3). Concentrations of 1.28 ppm biomarker in MSCs group vs adipogenic differentiation group were as follows: (0.66 ± 0.17)n mmol/L vs (1.18 ± 0.07)n mmol/L (P < 0.01)(Fig. 4). Here, we also find that mobile lipid droplets are not the origin contributing to 1.28 ppm biomarker for the MSCs.

CONCLUSION: Our results don’t support the hypothesis that 1.28 ppm biomarker is specific for the NPCs, because it also in the MSCs and the cells adipogenic differentiation induced. Moreover, it indicates that it is valuable for monitoring the MSCs differentiation after cell transplantation, according to the 1.28 ppm biomarker changes. These, however, require more further experiment evidences to confirm.
