Regeneration and structural changes of the nerve tissue after the extracellular matrix modification.

Abstract

ECM modification may contribute to changes in nerve tissue plasticity. Therefore, 4-methylubulliferone is used in our study, which disrupted the structure of the perineuronal networks surrounding some types of neurons responsible for the formation of memory traces. Mice were fed a 4-MU diet (6.7 mg / g / day) for 6 months, which improved their memory skills in a spontaneous recognition test without a significant adverse effect on the kidneys, liver, or joints.In the next part of the study, an extracellular matrix (UC-ECM) was derived from fetal human umbilical cord tissue also generated as biomimetic hydrogel. Due to the generated UC-ECM's low stability and rapid degradation, the structure was stabilized by covalent genipin bonding. Stabilization with 1 mM genipine increased the biological stability of the material. UC-ECM as well as ECM/G didn't show toxicity *in vitro* in mesenchymal stem cell proliferation; axonal budding or neural stem cell growth and differentiation were not adversely affected. The biocompatibility of both materials was verified *in vivo* by applying the material to an intracortical photothrombotic rat lesion, where gelation and infiltration of the lesion and hydrogel by host cells were observed 1 and 14 days after aplication. In conclusion, ECM is an essential structure of nervous tissue that affects both proper physiological function, neuromodulation, and among other things, the learning process. Also, it affects repair processes in nerve tissue injury.

Keywords

4-Methylumbelliferone**, collagen, extracellular matrix, hyaluronic acid, hydrogel, memory, neuroplasticity, perineuronal nets, umbilical cord**