Regeneration of Cartilage Tissue using an RWV Bioreactor System

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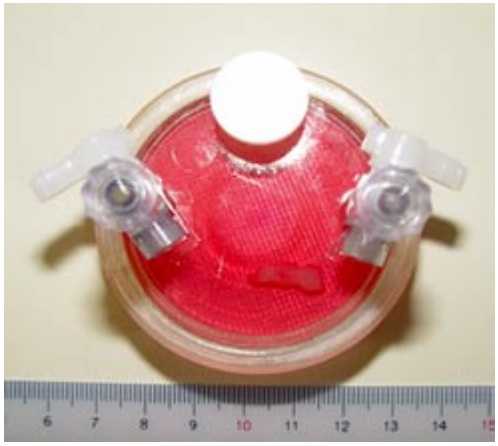
Establishment of a cartilage tissue regeneration technique is needed to treat bone diseases such as osteoarthritis. However, problems such as necrosis of cells due to high-density cell culture and shear stress by gravity have not yet been solved. Thus, we examined an RWV bioreactor that simulates a micro-gravity environment. Rabbit bone marrow cells were seeded in the RWV reactor. Large cell aggregate with a longer diameter of about 1.5 cm was formed after 4 weeks. Histochemical and biochemical analysis confirmed that large and homogenous three-dimensional cartilage tissues were successfully generated without necrosis by culture of bone marrow cells in an RWV bioreactor.



Formed cartilage tissue cultured for 4 weeks in the RWV bioreactor

A Small Modulatory dsRNA Specifies the Fate of Adult Neural Stem Cells

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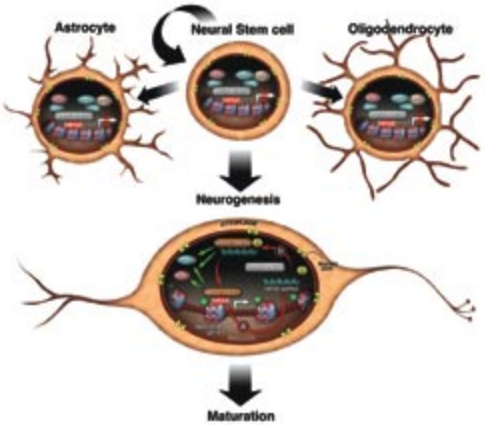
Discovering the molecular mechanisms that regulate neuron-specific gene expression remains a central challenge for CNS research. Here, we report that small, non-coding double-stranded (ds) RNAs play a critical role in mediating neuronal differentiation. The sequence defined by this dsRNA is NRSE/RE1, which is recognized by NRSF/REST, known primarily as a negative transcriptional regulator that restricts neuronal gene expression to neurons. The NRSE dsRNA can trigger gene expression of neuron-specific genes through interaction with NRSF/REST transcriptional machinery, resulting in the transition from neural stem cells with neuron-specific genes silenced by NRSF/REST into cells with neuronal identity that can express neuronal genes. The mechanism of action appears to be mediated through a dsRNA/protein interaction, rather than through siRNA or miRNA. The discovery of small modulatory dsRNAs (smRNAs) extends the important contribution of non-coding RNAs as key regulators of cell behavior at both transcriptional and post-transcriptional levels.



Schematic representation of activation events by NRSE dsRNA. NRSE dsRNA can trigger gene expression of neuron-specific genes through interaction with NRSF/REST transcriptional machinery. This interaction results in the NRSF/REST complex no longer binding to HDACs, MeCP2, and MBD1.