

Test4

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Brain subtissue-specific gene expression reflects neuronal development processes

There was a significant overlap between the genes in the different brain tissues, hence we decide to investigate the genes in the tissues with their maximal expression. The discovered genes were examined with NCBI to determine their function. The genes of interest are categorized in three groups:

1. Genes of Ion channels 2. Genes for neuronal development 3. Genes of cytokines

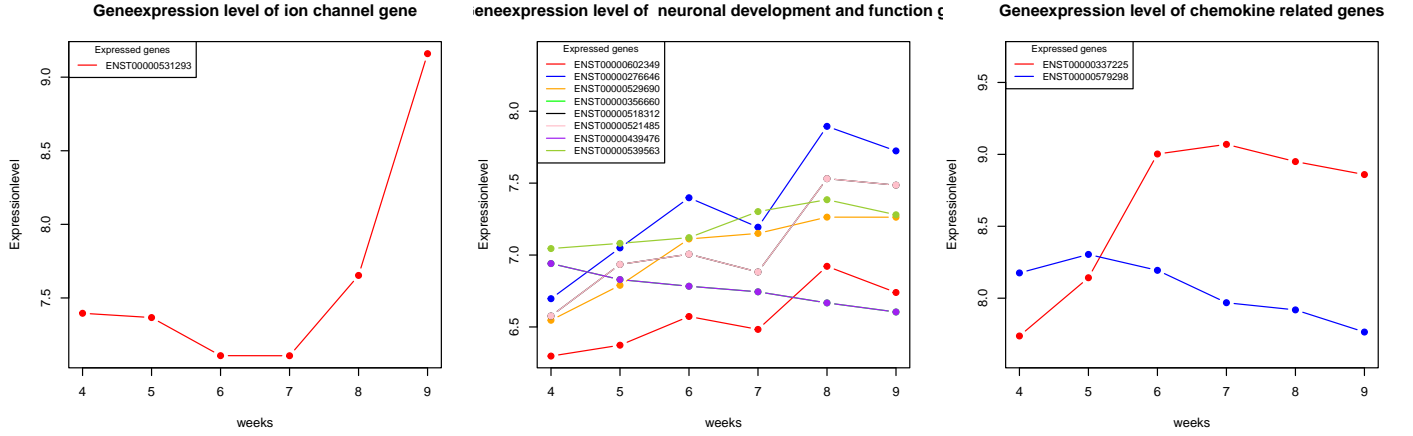


Figure 1: Gene expression of different genes for ion channel (left), neuronal development and function (middle) and related to chemokine (right) was plotted for week 4 to 9.

Ion channel

Ion channels play an important role in the function of neurons. We discovered that ENST00000531293 is highly expressed in Nucleus accumbens. It shows a significant increase between weeks 7 to 9 and codes for SLN sarcolipin which is a Sarcoplasmic reticulum Ca^{2+} -ATPase.

Genes for neuronal development and function

The second group are genes with a specific function in the neuronal development and function. Therefore we discovered that ENST00000276646 and ENST00000529690 show a significant increase in gene expression over the weeks. Both genes were connected to the Cerebellar Hemisphere and were associated with SYBU (syntabulin). SYBU plays an important role as it contributes to activity-dependent presynaptic assembly in neuronal development.

Filtering mentioned four genes for axon guidance:

ENST00000602349 codes for NXPH1 (neurexophilin 1) which forms a tight complex with neurexins. Neurexins promote the adhesion between axons and dendrites. ENST00000602349 shows a strong increase, especially between weeks 7 to 8 and is connected to Anterior cingulate cortex.

ENST00000518312 and ENST00000521485 encode for SNAP91 (synaptosome associated protein 91) which plays a role in regulation of clathrin-dependent endocytosis. Therefore SNAP91 is important for axonal functions of neurons like postsynaptic density, which is essential for functional neurons (Overhoff et al. 2020). ENST00000518312 & ENST00000521485 were associated with Cerebellar Hemisphere and also show significant increase between weeks 7 to 8.

In addition ENST00000539563, encoding for LSAMP (limbic system associated membrane protein), plays a role in axon guidance. The encoded preprotein is processed into neuronal surface glycoprotein which interacts as an adhesion molecule during axon guidance and neuronal growth in the developing limbic system. ENST00000539563 is associated with Putamen which is grouped in basal ganglia. Basal ganglia were associated with the limbic system.

ENST00000356660 and ENST00000439476 code for BDNF (brain derived neurotrophic factor). A binding of BDNF to its receptor promotes neuronal survival. Both genes show an identical decline in expression over the weeks. Nevertheless, ENST00000356660 is connected to Cerebellar Hemisphere and ENST00000439476 to Hippocampus.

Chemokine related genes

The last group are chemokine, they take up an important part in the signaling process during neuronal development (Tiveron 2008). We discovered ENST00000337225, which encodes for CXCL14 (alpha class chemokine ligand).

ENST00000337225 shows a significant increase in expression between weeks 4 to 6 and is related to Anterior cingulate cortex. ENST00000579298 encodes for NUP85 (nucleoporin 85), a protein component of the Nup107-160 subunit of the nuclear pore complex. NUP85 can bind to CCR2 (a receptor for beta class chemokines) and promotes chemotaxis of monocytes. ENST00000579298 is related to the Frontal Cortex and shows a decline between weeks 5 to 9.