The balancing act to regulate the brain machinery

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Molecular imbalance lies at the root of many psychiatric disorders. Current EU-funded research has discovered a major RNA molecular player in neurogenesis and has characterised its action and targets in the zebrafish embryo.

Neural circuits are constantly in the process of modification according to experience and changes in the environment, a phenomenon known as plasticity. Classical Hebbian plasticity is crucial for encoding information whereas homeostatic plasticity stabilises neuronal activity in the face of changes that disturb excitability.

Homeostatic plasticity plays a big role in activity-dependent

development of neural circuits. Interestingly, this type of homeostasis is frequently distorted in psychiatric disorders such as schizophrenia and autism.

Unlike the molecular basis of Hebbian homeostasis, the biochemistry behind homeostatic plasticity is relatively unknown. The 'MicroRNAs and neurogenesis control' (Neuromir) project set about investigating neural development in the zebrafish embryo to unravel the action of one class of gene regulator in particular – microRNAs.

The microRNA machinery is potentially very powerful in cell regulation. It influences many development processes and each microRNA molecule can regulate hundreds of target genes.

Numerous microRNAs are expressed in the development of the vertebrate central nervous system (CNS). Results from the in vivo study of the zebrafish revealed that miR-9 plays an important role in balancing the production of neurons during development of the embryo.

Neuromir researchers have successfully identified the molecular targets of miR-9. Future research may exploit this knowledge base by assessing their importance in disease and using their molecular format for drug therapy design.

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