

### Description for the general public

The brain ventricular system located inside the brain consists of ventricles and connecting channels. It is filled with the cerebrospinal fluid, which circulates through. This system plays an important role during brain development as well as normal physiology of the brain during whole life. By shaping insides of the brain, it supports formation of new neural cells. It also provides nourishment for these cells as well as removes their metabolites. No wonder that disturbance of the ventricular system results in abnormal function of the brain and, eventually, brain disease. Many brain disorders represent complex chronic and incurable conditions with disabling defects that may continue for years and even decades. These disorders may affect anyone, including rich and famous (eg. the former President of United States Ronald Reagan, Irish writer Iris Murdoch or American actor Charles Bronson). In 2004 it was estimated in Europe that 35% of all disease burden is attributable to brain disorders with total cost close to 400 billion Euro per year, i.e. twice the estimated cost of cancer. Now ten years later a recent estimate in the USA shows almost the same ratio (New York Times, 26 October, 2015). To large extent this is due to a lack of drugs for treatment of neurodegenerative diseases unlike that in oncology and cardiology, where quite a few efficient drugs were developed recently.

To begin tackle these problems biology of the brain ventricular system should be understood better. Initially the molecular determinants of the brain ventricular system, i.e. genes and their regulation during development and disease must be identified for further studies. Fortunately, the brain ventricular system is evolutionarily conserved. This means that its many elements could be studied in model animals, including the zebrafish - a small ornamental fish. This animal model provides a possibility to design and make animals expressing fluorescent marker genes in cells lining the brain ventricular system. This makes it easy to isolate these cells and genes active in them could be identified in bulk and studied. This approach helps to accelerate a process of accumulating knowledge on regulation of essential genes involved in development of the brain ventricular system and brain disease. Upon identification of such regulatory genes, this knowledge will help to develop better therapy for brain disorders and improve quality of patients' life.