Abstract

Left-right asymmetry in vertebrates is determined by the temporary embryonic structures called organizers of left-right asymmetry. These structures are formed by cells with motile cilia. Based on this motility, the cilia generate a leftward flow of extracellular fluid, which triggers asymmetric expression of genes that are part of the so-called Nodal signaling pathway. The main members of this cascade are Nodal, Lefty and Pitx2, which are responsible for the establishment of left-right asymmetric structure of internal organs.

In ray-finned fishes, a hollow spherical structure called Kupffer's vesicle has been described as the organizer of left-right asymmetry. However, this organizer has only been studied in members of the Teleostei group (zebrafish, medaka) and whether it also appears in other ray-finned fishes is still unknown. This thesis focuses on the study of the left-right organizer in the so far unexplored species – the sterlet sturgeon (*Acipenser ruthenus*) as a species of non-teleost ray-finned fishes.

Based on images from an electron microscope, we observed that the sturgeon organizer forms a teardrop shape near the blastopore and contains ciliated cells. Rather than Kupffer's vesicle, it resembles the left-right organizer of amphibians, i.e. the gastrocoel roof plate. This Diploma thesis analyzes the position and length of the cilia followed by the presence of the Nodal signaling pathway. Pharmacological inhibition of this pathway results in disorders in heart tube coiling and absence of asymmetric expression of *Pitx2* in the brain. The functionality of H+K+-ATPase was also tested and suggested that it is necessary for left-right asymmetry establishment during blastula stages, but not during stages with the organizer.

Our results show that like in amphibians the left-right organizer in non-teleost ray-finned fishes is the gastrocoel roof plate. The development of the sturgeon has many features in common with the development of amphibians, but it differs from closely related teleost group, where Kupffer's vesicle has been discovered. The presence of the gastrocoel roof plate in non-teleost ray-finned fishes thus contributes to the hypothesis of the evolutionary origin of the Kupffer´s vesicle from gastrocoel roof plate.