**The role of ion channels and pumps in tumor metastasis**

Metastasis is a major cause of cancer-related deaths. Evidence is accumulating for the role of various ion channels and ion pumps in metastatic activity of tumor cells. The plasma membrane Ca2+  ATPase (PMCA) has been identified as a metastasis suppressor, and an increased expression of voltage gated sodium channels (Nav) have been shown to promote metastasis. In this project we studied the combined effect of these two transmembrane proteins on the progression of tumors. We found that Nav inhibitors decreased migration activity of A375 melanoma cells by 20%, while overexpression of PMCA4b by ~70%. The effects were non-additive. We investigated the mode of action of Nav inhibitors, and identified non-blocking modulation as a novel, therapeutically favorable mechanism for riluzole. Our hypotheses were tested using *in silico* modeling methods. In addition, we investigated conformational transitions of PMCA in the presence of PIP2, in order to identify possible drug targets.