Dr. Moiseenkova-Bell started her career in science after being accepted to one of Russia's most prestigious science programs at Moscow State University (MSU). In her graduate studies at MSU she conducted research on the understanding of light and thermal interaction with living organisms. In 1999 she received a Master of Science in Biophysics at MSU. The same year she came to the US to work at the University of Texas Medical Branch (UTMB) in Galveston on an Air Force sponsored research project. This project was focused on understanding temperature sensation in reptiles and insects with the goal to mimic these properties for military use.

In 2000, she was accepted into the Biomedical Sciences graduate program at UTMB, where she continued studying proteins involved in temperature and pain sensation. During her graduate studying, her passion for the understanding the structure and function of TRP channels began, which still continues to this day. She received her PhD in 2004 from UTMB and did her postdoctoral work under Dr. Theodore Wensel at Baylor College of Medicine in Houston. Her outstanding contributions to research have resulted in numerous awards and grants, including most recently the Ruth McLean Bowman Bowers Excellence in Research Award and the Mount Sinai Health Care Foundation Scholar award. She has the distinction of being the first investigator to provide a structure of the TRPV1 channel using cryo-electron microscopy and single particle reconstruction, as published in PNAS and presented at several prestigious international meetings.

Since joining the faculty at Case Western Reserve University as assistant professor in 2009, Dr. Moiseenkova-Bell has continued her research using electron microscopy to study the structure and function of TRP channels, which are important ion channels implicated in numerous sensory, inflammatory and chronic pain states. Her research aims to elucidate the molecular basis of TRP channel involvement in these conditions, which will enable the design of more effective drug treatment options for patients suffering from pain and inflammatory disorders.

Dissecting the underlying principles of pain and temperature sensation

While serving the beneficial function of provoking our attention to dangerous situations, pain is an unpleasant sensory and emotional experience. Millions of people suffer from unrelenting sensations of pain that no longer serve a beneficial purpose. One of the major mechanisms by which painful stimuli are detected is through Transient Receptor Potential (TRP) ion channels, which transduce a diverse range of physical and chemical energy into action potentials in sensory neurons. The Transient Receptor Potential Ankryin (TRPA) and Transient Receptor Potential Vanilloid (TRPV) subfamilies of channels are attracting a great deal of attention because of their ability to detect multiple pain, chemo- and thermo- stimuli, thus making them emerging drug targets for pain management. Our laboratory is interested in understanding molecular mechanisms by which TRPA1 and TRPV channels interact with ligands that activate and block conduction of pain signals, which could ultimately guide the development of new analgesic drugs.

Despite their established importance in pain sensation, the activation mechanisms of TRPA and TRPV channels are not currently understood at the molecular level. My laboratory research interest is to understand the mechanisms of channels activation through structure-function studies of these membrane proteins. By combining cryogenic electron microscopy, mass spectrometry, biochemistry and homology modeling, we are mapping the ligand-binding sites and functional domains within the structures and analyzing the structural rearrangements involved in activation and desensitization of TRP channels. In addition, we use biochemistry, cell biology and mass spectrometry to understand the role of the TRPV ion channels in neuronal cell development.