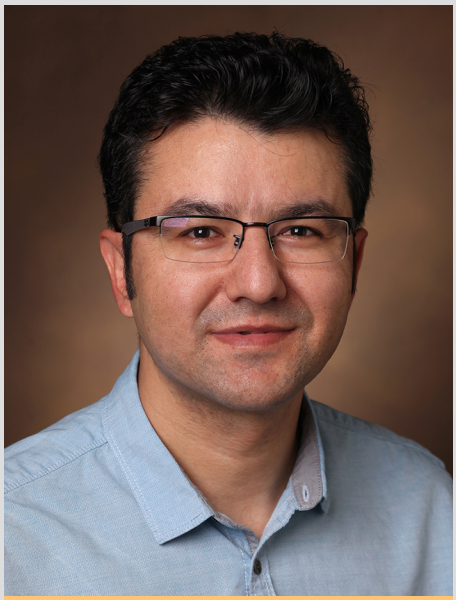

VANDERBILT SCHOOL OF MEDICINE | Basic Sciences

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Biosketch

Dr. Karakas received his PhD in Molecular and Cellular Biology from Stony Brook University where he used X-ray crystallography to study the molecular mechanism of nucleotide excision repair, an essential pathway to protect genome against environmental damage. Prior to joining Vanderbilt University in 2016, he completed his postdoctoral training at Cold Spring Harbor Laboratory, where he solved the structure of N-methyl-D-aspartate (NMDA) receptors, which belong to the ionotropic glutamate receptor family that mediates the majority of excitatory synaptic transmissions in the mammalian brain, at atomic resolution, and investigated how binding of neurotransmitters and drugs regulate receptor activity.

Key Publications

"Activation of NMDA receptors and the mechanism of inhibition by ifenprodil," ***Nature*****, 534(7605):63-8, 2016**

"Crystal structure of a heterotetrameric NMDA receptor ion channel," ***Science*****, 344(6187):992-7, 2014**

"Subunit arrangement and phenylethanolamine binding in GluN1/GluN2B NMDA receptors," ***Nature*****, 475(7355):249-53, 2011**

"Calcium Channels: Structure, function, and pharmacology"

Research in the Karakas Lab focuses on **structural and functional characterization of calcium channels** to elucidate the molecular mechanism of ion channel activity and regulation in healthy and diseased states. Calcium acts as universal messengers required to regulate diverse physiological processes including fertilization, muscle contraction, apoptosis, secretion, and synaptic plasticity. Calcium channels are essential components of the calcium signaling toolkit and their **aberrant activity** is associated with a number of diseases including **cancer, metabolic and neurodegenerative diseases**. Specific targets being studied include:

· ***N*-methyl-D-aspartate receptors (NMDARs)**, ligand-gated calcium channels that belong to the ionotropic glutamate receptor family. NMDARs are involved in synaptic transmission in the central nervous system and essential for basic brain function including learning and memory. Aberrant NMDAR activity is implicated in various neurodegenerative diseases including **Alzheimer's and Parkinson's diseases**, and psychological disorders such as **schizophrenia and depression**.

· **Inter-organelle calcium signaling machinery**, which mediates sustained calcium transfer from endoplasmic reticulum (ER) to mitochondria to maintain cellular bioenergetics. Excessive or reduced calcium transfer leads to **apoptotic cell death or autophagy**, respectively. Consequently, calcium signaling at ER-mitochondria interface plays an essential role in cell fate decisions and could be an **invaluable target**when the cell fate decision machinery is compromised, as observed in **cancer (evasion of apoptosis)** and **neurodegenerative diseases (excessive apoptosis)**.