According to the Alzheimer’s Association, more than 5 million Americans are living with Alzheimer’s. One in three seniors die with this disease or another type of dementia. The potential to eliminate this painful disease lies within calmodulin, an intra-cellular receptor protein that is found throughout the body but functions in the brain to affect learning and memory. Calmodulin (CaM) plays a role in cell growth, proliferation and movement of electrons within the electron-transport chain. Calcium enters from the pre-synaptic side of the spine of a dendrite within the brain and binds to calmodulin causing a conformational change of the calmodulin itself. Calcium binds to the EF hand motif (a conserved helix-loop-helix sequence) found in calmodulin. The action of the calcium binding induces a conformational change to calmodulin, which forms a calmodulin-complex. An enzyme, calcium/calmodulin-dependent protein kinase II (CaMKII) binds to and activates the calmodulin-complex. Activation causes an influx in the amount of α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid receptors (AMPAR), which increases the amount of calcium entering the cell. Researchers believe that an increase in calcium absorbed directly impacts the durability and stability of the brain. The West Bend SMART (Students Modeling A Research Topic) modeled CaM using 3-D printing technology. Further calmodulin studies could prove to be the key to developing therapeutic treatments for mental illness, as well as finding ways to increase mental function.

According to the University of Minnesota Nun study, an Alzheimer’s patient’s brain will experience observable shrinkage as the disease progresses. Alzheimer’s and other forms of dementia.

The western blot shown here examines calcium-dependent binding of CaM to two proteins, neurogranin (Ng) and CaMKII. When CaM is calcium-bound it undergoes a conformational change. CaM-binding proteins generally only bind to either the calcium-free CaM or calcium-bound complex, not both. The presence of a band in the blot (shown bottom right) signifies protein that bound complex, not both. The presence of a band in the blot (shown top right) signifies protein that bound to CaM in either the calcium condition or EDTA, calcium free condition. Ng, both endogenous and infected, only bound CaM in the calcium condition. This demonstrates the reciprocal relationship between Ng and CaMKII in regards to calcium-dependent binding. This study gives insight into the function of CaM within the dendritic spine.

**REFERENCES**