

## **Insufficient Intracellular Calcium Ion Causes Mitochondrial Dysfunction and Inactivation of Mesenchymal Stem Cells: Sigma Anti-Bonding Molecule Calcium Carbonate (SAC), the New Technology to Treat Aging-Related Chronic Degenerative Diseases**

It is prevalently known that tumour cells prefer inefficient cellular glycolysis, but no one has proved yet the exact reason of using ineffective cellular respiration mechanism of tumour cells. However, through our research, we have investigated that it is highly related to the lack of intracellular calcium ion because as the insufficient calcium ion causes dysfunction of mitochondria which releases reactive oxygen species (ROS), it causes mitochondrial protein mutation such as TDP-43, FUS and SOD1. Therefore, endoplasmic reticulum (ER) gets stressed and it ultimately causes alteration of RNA synthesis.

The lack of calcium ion fails to oscillate calcium influx in mitochondria which leads to inactivation of mesenchymal stem cells. Through our research, we have found out that the cause of lack of intracellular calcium ion is derived from increase in lactate ( $C_3H_6O_3$ ) and ammonia ( $NH_3$ ) production which is the result of mitochondrial dysfunction. In other words, due to the mitochondrial dysfunction, tumour cells can provoke more cellular glycolysis. Therefore, in order to reactivate mitochondrial function, it is important to balance the intracellular calcium ion level.

We have investigated that Sigma Anti-Bonding Molecule Calcium Carbonate (SAC) is effective in normalizing mitochondrial function. When we have extracted mice' muscle cells and left them in room temperature ( $25^{\circ}C$ ) for 15 minutes and injected 0.0012% SAC solution into them. And while we have observed the change in muscle cells in every 10, 15, 40 and 60 seconds with infrared radiation, we observed the temperature increase, indicating normalization of mitochondrial function. Therefore, our research concludes that SAC is effective in balancing intracellular calcium ion level and may find application in treating mitochondrial dysfunction-related chronic degenerative diseases and effective stem cell treatments.