

Structural changes of mitochondria and their calcium distribution during cell death

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Mitochondria offer their energy for surviving [1] and control death or life [2]. Recently, it was reported that mitochondria and calcium ion could regulate their death and alive, too [3],[4]. The transfer of calcium from the ER to mitochondria, mitochondrial calcium uptake, and the consequence of cell death have drawn much attention in the structure-function relation studies. C2-ceramide has been known a drug to induce cell death through mitochondria and calcium [5]. The present study has been attempted to reveal the ultrastructural changes that occur during induced apoptosis in HeLa cells when combined with ceramide. The functional importance of calcium transfer from the ER to mitochondria and on the consequence for cell death in those cells will be discussed. In this study, HeLa cells were induced cell death by C2-ceramide and rapid freezing. Then the calcium ion distribution in HeLa cell was detected by ToF-SIMS.

References

- [1] K.G. Lyamzaev et al, *Acat. Biochimica Polonica*, 51(2004)
- [2] Xiaodong Wang, *GENES & DEVELOPMENT* 15(2001) 2922
- [3] M.P. MURIEL et al, *THE JOURNAL OF COMPARATIVE NEUROLOGY* 426(2000) 297
- [4] P. Pinton, Davide Ferrari, Elena Rapizzi, Francesco Di Virgilio, Tullio Pozzan and Rosario Rizzuto, *The EMBO Journal*, 20(2001) 2690
- [5] F. Darios et al, *Journal of Neurochemistry*, 84(2003) 643

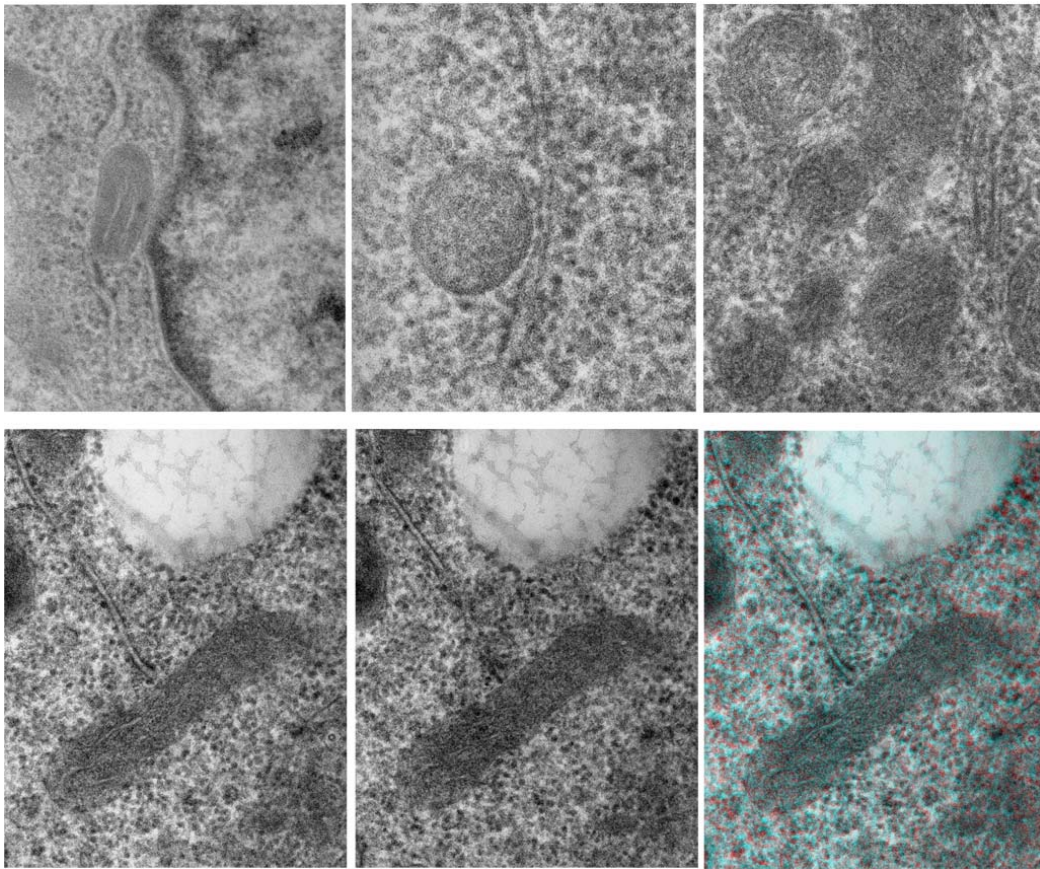


Figure 1. Mitochondria closed to ER in the 4 minute after C2-ceramide treatment. A) Mitochondria attached to ER near nuclear, B) Mitochondria closed to ER, C) Mitochondria closed to each other. Stereo images of mitochondria closed to ER and adjacent mitochondria in the 4 minutes after C2-ceramide treatment. D) -8° tilted image, E) $+8^\circ$ tilted image, F) Anaglyph of D) and E).

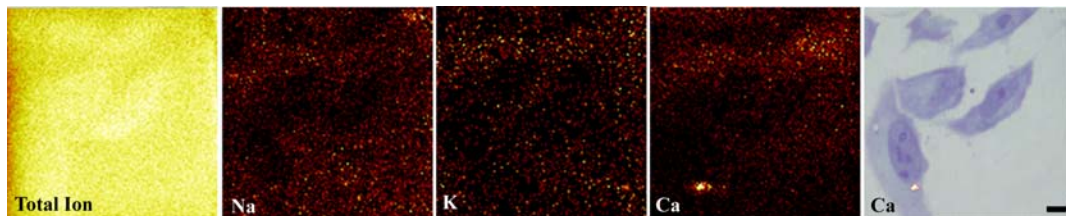


Figure 4. Ion Mapping by ToF-SIMS. In the 4 minutes after C2-ceramide treatment. Na, K, and Ca ions were showed. After analysis of ToF-SIMS, the sectionated were stained with toluidine blue, then Ca mapping image was merged with light microscope image. Here calcium spot displayed near nuclear.