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Metabolo-Epigenetics: Mitochondrial metabolism and biogenesis as key players and targets of epigenetic regulation

In recent years, the extremely close relationship between mitochondrial DNA (mtDNA) and nuclear DNA (ncDNA) has been successfully worked out at the epigenetic level. There are anterograde effect chains based on the ncDNA on the mtDNA and retrograde effect chains based on the mtDNA on the ncDNA. In addition to the metabolic performance of the OxPhos and the redox status of the mitochondria, their nucleotide content in the form of ATP, mtDNA and mtRNA also has a significant influence on methylation, acetylation and expression of the nuclear DNA. In this context, exogenous nucleotides have proven to be highly efficient instruments for modulating the quality of the mitochondria. At the same time, nuclear transcription factors such as PGC1 and Nrf2, which promote the expression of mitochondrial proteins and mitochondrial biogenesis in general, are excellent intervention targets and can be activated to a high degree by curcumin. In this respect, the curcumin / nucleotide combination opens up completely new perspectives in terms of transcriptional, translational and post-translational control. Against the background of secondary mitochondriopathy as a universal morbidity factor, there is a new, extremely promising intervention option.