



GLOBAL SKIN HEALTH

NIACINAMIDE IMPROVES MITOCHONDRIAL FUNCTION IN HUMAN SKIN CELLS

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Introduction: Mitochondria are extremely important organelles required for cellular energy production, and decline in function is involved in many health problems including skin ageing. Niacinamide is a member of the vitamin B family (vitamin B3) shown previously to result in improvements in inflammatory conditions, cancer prevention, and ATP synthesis, and is therefore a promising candidate for the treatment of a range of skin damage.

Objective: The mode of action by which niacinamide exerts its effects on skin is unknown; effects of long-term niacinamide incubation on primary skin cells was therefore analysed in terms of mitochondrial gene expression and activity, with a focus on electron transport chain complexes I, II, and IV.

Materials and Methods: Cells were incubated in the presence of niacinamide for 7 days. Gene expression of mitochondrial subunits was determined following RNA extraction, reverse transcription, and quantitative PCR. The activities of individual complexes were determined spectrophotometrically.

Results: Gene expression of mtDNA-encoded subunits of complexes I and IV significantly increased following 7 days of niacinamide treatment ($P=0.04$ and $P<0.01$). This was also the case for a ribosomal marker of overall mtDNA content. Nuclear-encoded gene expression of complexes I and IV was increased ($P<0.01$ and $P=0.04$); however, nuclear-encoded gene expression of complex II was unchanged. These changes in gene expression correlated with changes in activity, for which significant increases in activity for complexes I and IV ($P<0.01$ and $P=0.02$), but not complex II, were observed.

Conclusions: Long-term niacinamide treatment increased gene expression and activity of mitochondrial complexes I and IV, but not complex II. Interestingly complex II is entirely nuclear-encoded; it could therefore be speculated that niacinamide is increasing mtDNA, resulting in an increase in corresponding complex nuclear genes via cross-talk. This improvement in mitochondrial function may prove useful in terms of health benefits to the skin in future treatments.

