

Supplementary Materials

# The Combination of Niacinamide, Vitamin C, and PDRN Mitigates Melanogenesis by Modulating Nicotinamide Nucleotide Transhydrogenase

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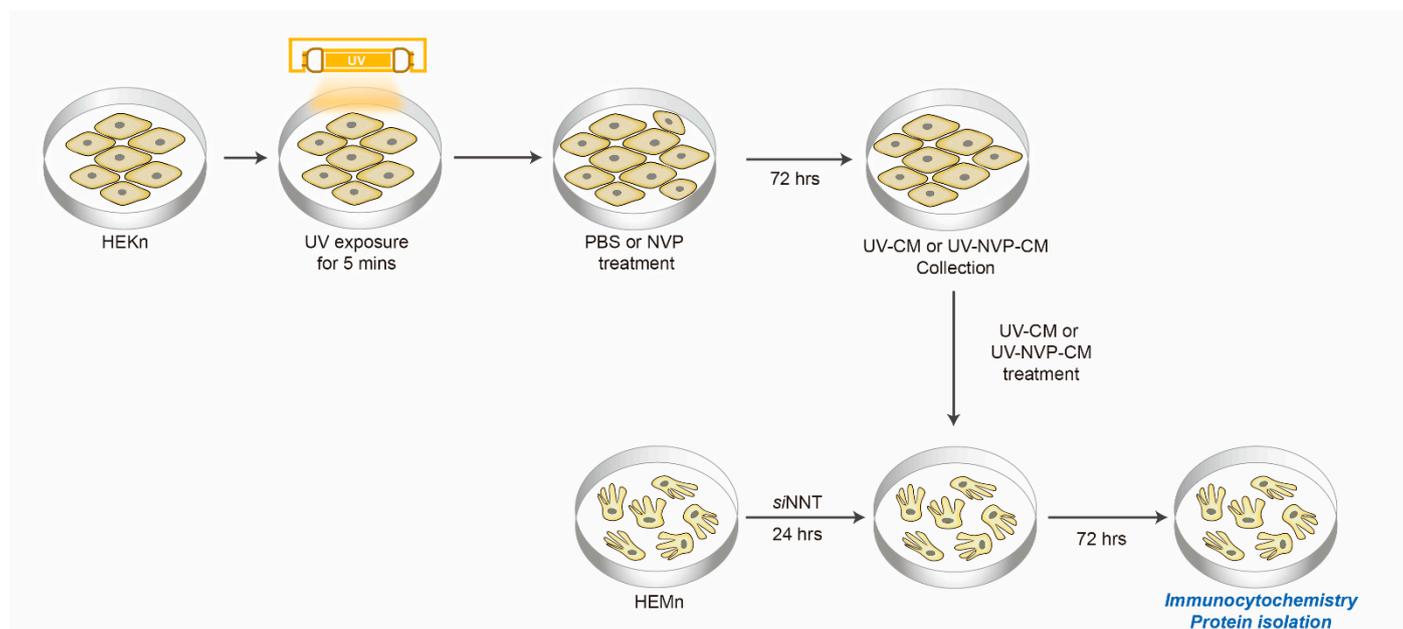
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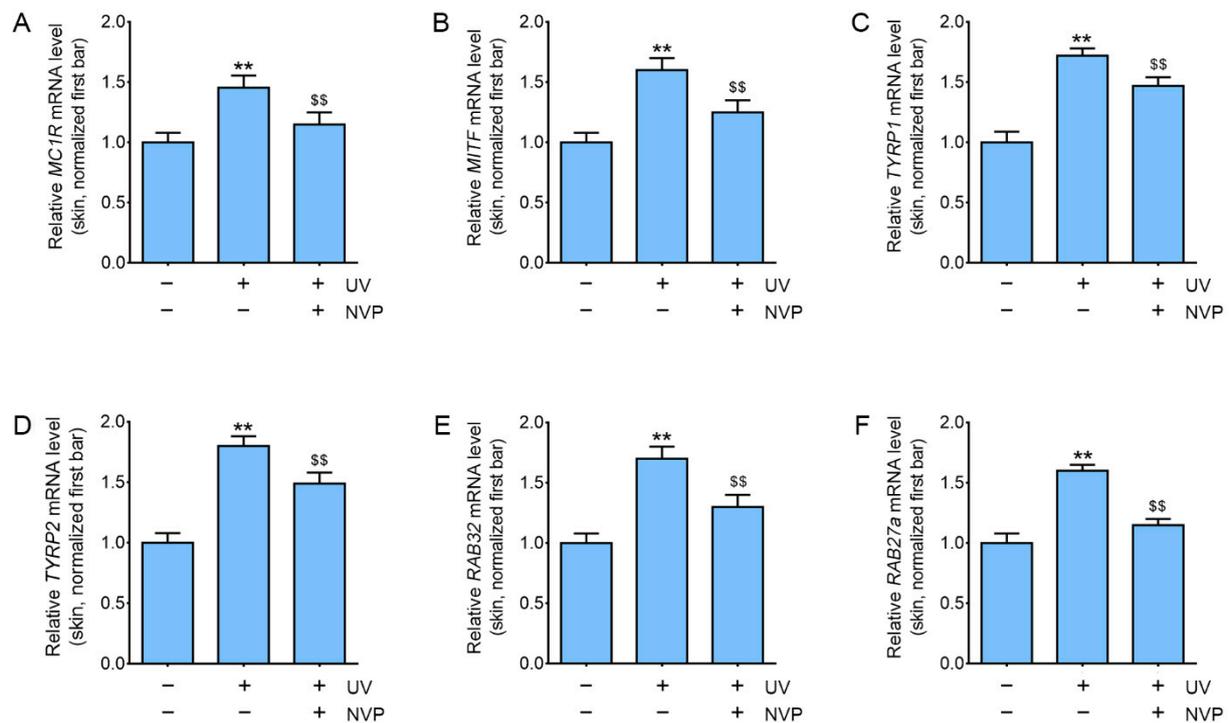
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**Table S1.** List of primers used for quantitative real-time polymerase chain reaction.

Gene (Host)		Primer
<i>Actb</i> (Mouse)	Forward	5'-CCG TAA AGA CCT CTA TGC CAA C-3'
	Reverse	5'-GCA GTA ATC TCC TTC TGC ATC C-3'
<i>MC1R</i> (Mouse)	Forward	5'-CAA GCA GCG GCA GAA AAA GT-3'
	Reverse	5'-TGG GAC TCA GAT ACG CCTGA-3'
<i>MITF</i> (Mouse)	Forward	5'-GAG AAC TGC AGC CAG GAA CT-3'
	Reverse	5'-GCC GCA TTT AGA AAG CGA GA-3'
<i>TYRP1</i> (Mouse)	Forward	5'-AGG GTG GAC CAA TCA GGA GA-3'
	Reverse	5'-CCG CAT CAG TGA AAG TGT GC-3'
<i>TYRP2</i> (Mouse)	Forward	5'-CCT GAA TGG GAC CAA TGC CT-3'
	Reverse	5'-GAA AAG CCA GCA ACC CCA AG-3'
<i>RAB32</i> (Mouse)	Forward	5'-GAC AGG AAC GGT TTG GCA AC-3'
	Reverse	5'-GGG TAA AGT CAC AGG GCC TC-3'
<i>RAB27A</i> (Mouse)	Forward	5'-GTG GGG CCA GAC GGA AAA TA-3'
	Reverse	5'-GTC CTC GCT GTG CTC TAT CC-3'
<i>Actb</i> (Human)	Forward	5'-CTC GCC TTT GCC GAT CC-3'
	Reverse	5'-TCT CCA TGT CGT CCC AGT TG-3'
<i>MC1R</i> (Human)	Forward	5'-ACT TCT CAC CAG CAG TCG TG-3'
	Reverse	5'-CAT TGG AGC AGA CGG AGT GT-3'
<i>MITF</i> (Human)	Forward	5'-AGA GAA GGT GCA CGT AAG CG-3'
	Reverse	5'-ATC TGC ATA CAG GAC GCT CG-3'
<i>TYRP1</i> (Human)	Forward	5'-GTG CCA CTG TTG AGG CTT TG-3'
	Reverse	5'-ATG GGG ATA CTG AGG GCT GT-3'
<i>TYRP2</i> (Human)	Forward	5'-AAA GCC TGA CTT AAC GGG GG-3'
	Reverse	5'-GGA TTT TGC AGC CCA AGC AA-3'
<i>RAB32</i> (Human)	Forward	5'-TCC AAA TGG CAG CCC TAT CC-3'
	Reverse	5'-CAT CCG GCA AAG CCA TGT TC-3'
<i>RAB27A</i> (Human)	Forward	5'-AGT TGA TGG AGC GAA CTG CT-3'
	Reverse	5'-CCC TAC ACC AGA GTC TCC CA-3'



**Figure S1.** Schematic diagram of the in vitro experiment in this study. Human keratinocytes were exposed to UV irradiation for 5 mins, and then NVP-mix was added. The supernatants from these cell cultures were collected (CMs). Then, melanocytes or NNT-silenced melanocytes were treated with CM. CM, conditioned medium; HEK<sub>n</sub>; human primary epidermal keratinocyte; HEM<sub>n</sub>; human primary melanocyte; hrs, hours; mins, minutes; NVP, niacinamide + vitamin C + polydeoxyribonucleotide; PBS, phosphate-buffered saline; siNNT, silencing with nicotinamide nucleotide transhydrogenase; UV, ultraviolet.



**Figure S2.** Regulation of the expression of MC1R, MITF, TYRP1, TYRP2, RAB32, and RAB27A after NVP-mix treatment of UV-irradiated animal skin. (A–F) The mRNA expression levels of MC1R (A), MITF (B), TYRP1 (C), TYRP2 (D), RAB32 (E), and RAB27A (F) determined by quantitative real-time polymerase chain reaction in UV-irradiated animal skin. The mRNA levels were normalized to that of Actb and are expressed relative to the corresponding level in the control group. Data are presented as the mean  $\pm$  standard deviation; \*\*,  $p < 0.01$  second bar vs. first bar; \$,  $p < 0.05$ , \$\$,  $p < 0.01$  vs. second bar (Mann–Whitney U test). MC1R, melanocortin 1 receptor; MITF, microphthalmia-associated transcription factor; RAB27A, Ras-related protein Rab27A; RAB32, Ras-related protein Rab32; TYRP1, tyrosinase-related protein 1; TYRP2, tyrosinase-related protein 2; NVP, niacinamide + vitamin C + polydeoxyribonucleotide; UV, ultraviolet.