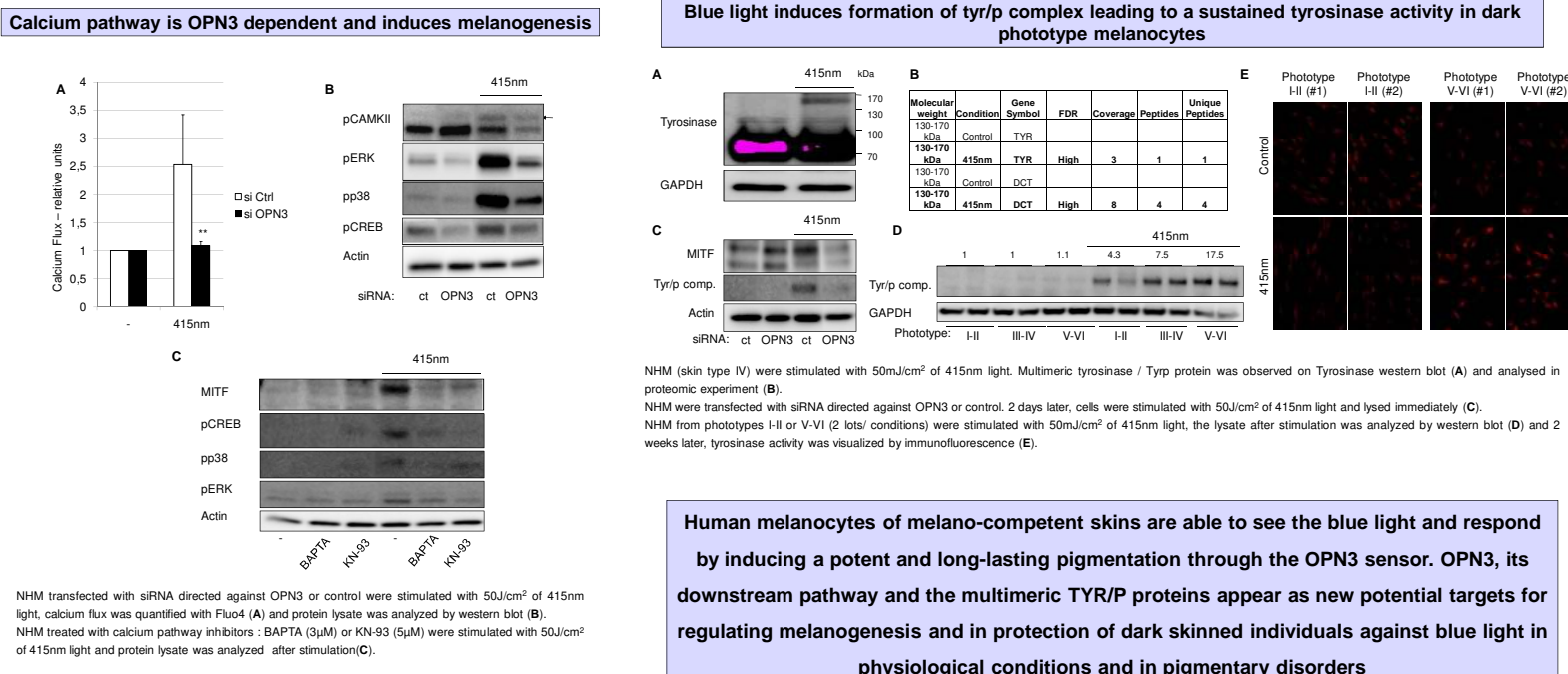
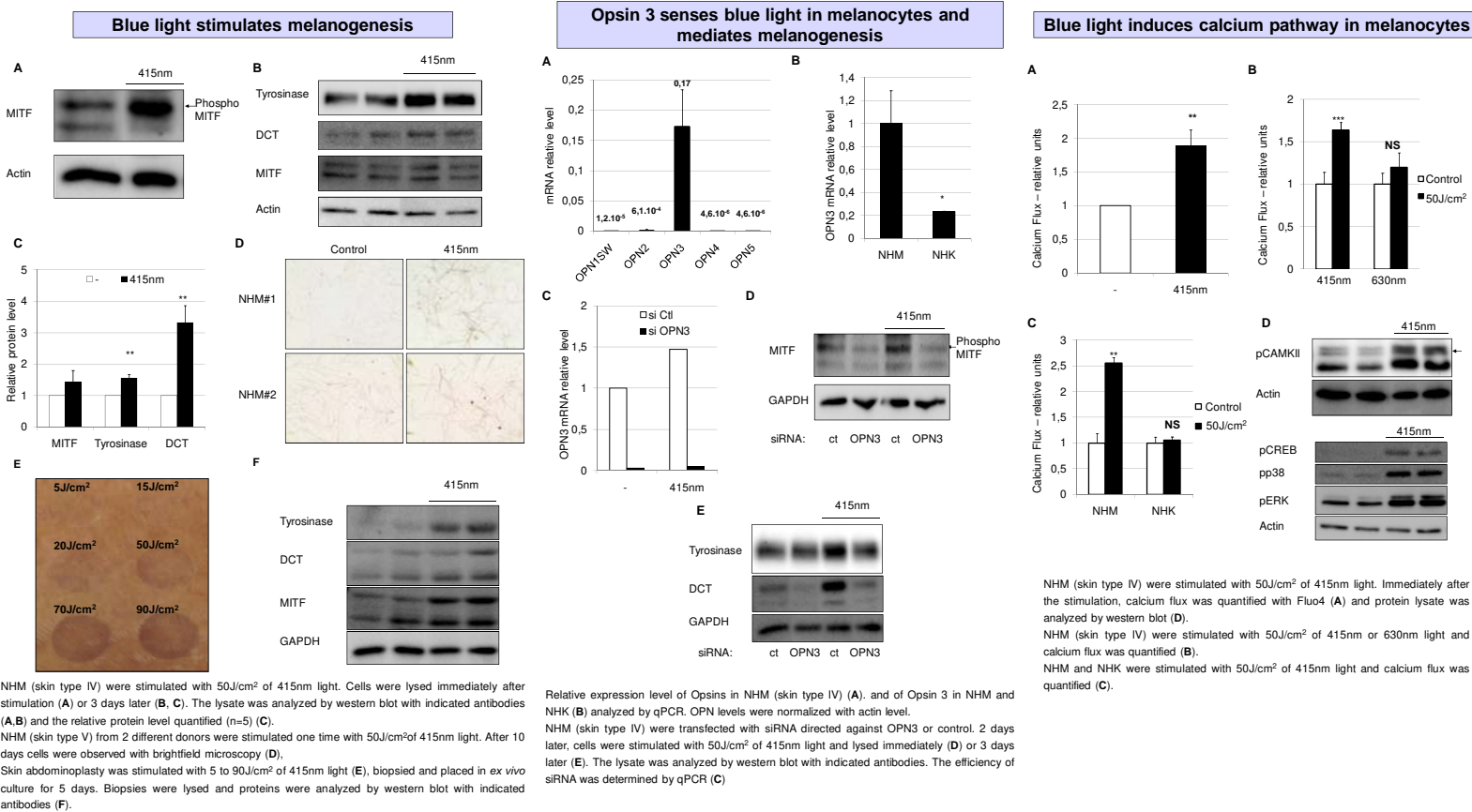


Melanocytes sense blue light and regulate pigmentation through the Opsin3

Claire Regazzetti¹, Laura Sormani¹, Delphine Debayle², Françoise Bernerd³, Meri K Tulic¹, Gian Marco De Donatis¹, Bérengère Chignon-Sicard⁴, Stéphane Rocchi⁵, Thierry Passeron^{1,6}

¹ C3M, INSERM U1065, team 12, Nice, France; ² IPMC, Institut de Pharmacologie Moléculaire et Cellulaire, Nice University, France; ³ L'OREAL Research and Innovation, Aulnay sous Bois, France; ⁴ Department of Plastic Surgery, University hospital of Nice, France; ⁵ INSERM, U1065, Centre Méditerranéen de Médecine Moléculaire (C3M), team 1, Nice, France; ⁶ Department of Dermatology, University hospital of Nice, France

The shorter wavelengths of the visible light have been recently reported to induce a long lasting hyperpigmentation but only in melano-competent individuals. Here, we provide evidence demonstrating that opsin 3 (OPN3) is the key sensor in melanocytes responsible for hyperpigmentation induced by the shorter wavelengths of the visible light. The melanogenesis induced through OPN3 is calcium-dependent and further activates CAMKII followed by CREB, ERK, and p38 leading to the phosphorylation of MITF and ultimately to the increase of the melanogenesis enzymes: tyrosinase and dopachrometautomerase (DCT). Furthermore, blue light induces the formation of a protein complex that we demonstrated to be formed by tyrosinase and DCT. This multimeric tyrosinase / Tyrp complex is mainly formed in dark-skinned melanocytes and induces a sustained tyrosinase activity, thus explaining the long-lasting hyperpigmentation that is observed only in skin type III and higher after blue light irradiation. OPN3 thus functions as the sensor for visible light pigmentation.



Human melanocytes of melano-competent skins are able to see the blue light and respond by inducing a potent and long-lasting pigmentation through the OPN3 sensor. OPN3, its downstream pathway and the multimeric TYR/P proteins appear as new potential targets for regulating melanogenesis and in protection of dark skinned individuals against blue light in physiological conditions and in pigmentary disorders