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Role of Exogenous Nitric Oxide Generated through Microwave Plasma Activate the Oxidative Signaling Components in Differentiation of Myoblast cells into Myotube

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Myoblast are myogenic precursors that proliferate, activate, and differentiate on muscle injury to sustain the regenerative capacity of skeletal muscle; The neuronal isoform of nitric oxide synthase (nNOS, termed also NOS-I) is expressed in normal adult skeletal muscle, suggesting important functions for Nitric oxide (NO) in muscle biology1,2,3. However, the expression and subcellular localization of NO in muscle development and myoblast differentiation are largely unknown. In this study, we examined effects of the nitric oxide generated by a microwave plasma torch, on proliferation/ differentiation of rat myoblastic L6 cells. Experimental data pertaining to nitric oxide production are presented in terms of the oxygen input in units of cubic centimetres per minute. The various levels of nitric oxide are observed depending on the flow rate of nitrogen gas, the ratio of oxygen gas, and the microwave power4. In order to evaluate the potential of nitric oxide as an activator of cell differentiation, we applied nitric oxide generated from the microwave plasma torch to L6 skeletal muscles. Differentiation of L6 cells into myotubes was significantly enhanced the differentiation after nitric oxide treatment. Nitric oxide treatment also increase the expression of myogenesis marker proteins and mRNA level, such as myogenin and myosin heavy chain (MHC), as well as cyclic guanosine monophosphate (cGMP), However during the myotube differentiation we found that NO activate oxidative stress signaling erks expression. Therefore, these results establish a role of NO and cGMP in regulating myoblast differentiation and elucidate their mechanism of action, providing a direct link with oxidative stress signalling, which is a key player in myogenesis. Based on these findings, nitric oxide generated by plasma can be used as a possible activator of cell differentiation and tissue regeneration.

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