

Effects of heat shock on survival, proliferation and
differentiation of embryonic stem cell-derived
neural stem cells

胚性幹細胞由来神経幹細胞の生存・増殖・分化に
対する温熱刺激の影響

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ABSTRACT

Hyperthermia during pregnancy is a significant cause of reproductive problems ranging from abortion to congenital defects of the central nervous system (CNS), including neural tube defects and microcephaly. Neural stem cells (NSCs) can proliferate and differentiate into neurons and glia, playing a key role in the formation of the CNS. Here, we examined the effects of heat shock on homogeneous proliferating NSCs derived from mouse embryonic stem cells. After heat shock at 42°C for 20 min, the proliferating NSCs continued to proliferate, although subtle changes were observed in gene expression and cell survival and proliferation. In contrast, heat shock at 43°C caused a variety of responses: the up-regulation of genes encoding heat shock proteins (HSP), induction of apoptosis, temporal inhibition of cell proliferation and retardation of differentiation. Finally, effects of heat shock at 44°C were severe, with almost all cells disappearing and the remaining cells losing the capacity to proliferate and differentiate. These temperature-dependent effects of heat shock on NSCs may be valuable in elucidating the mechanisms by which hyperthermia during pregnancy causes various reproductive problems.