Effects of growth hormone in the hippocampus and cortex of adult rodents

Akademisk avhandling

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Effects of growth hormone in the hippocampus and cortex of adult rodents

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Abstract

Background and Aims: Growth hormone (GH) affects proliferation, regeneration and specific plasticity in the adult brain. We aimed to investigate new mechanisms of local and circulating GH in the brain, and to explore the effects of different modes of administration of GH in rodents.

Methodology: GH transgenic male mice (GH-Tg) overexpressing astroglial GH were used. Hypophysectomised (Hx) female and male rats were substituted with GH. DNA microarrays were used to screen for transcripts responding to GH. Quantitative reverse transcription polymerase chain reaction (Q-RT-PCR) was used to confirm expression of transcripts and western blots to detect protein. Effects of GH were analysed with a statistical model allowing analysis of single transcripts, as well as categories of transcripts.

Results: In the hippocampus, GH-Tg did not influence selected neuronal transcripts whereas there was a modest effect on astroglial transcripts. Using DNA microarrays, we identified 24 single transcripts in the female cerebral cortex that were normalized by infusions of GH in Hx rats as compared to intact rats. Three transcripts were highly regulated by GH and confirmed by Q-RT-PCR. Of these three, only hemoglobin β (Hbb) was regulated in the hippocampus. In male and female rats, different modes of GH administration elicited robust responses on Hbb, twice-daily injections being more efficient than infusions. Effects on other transcripts were smaller, injections of GH were more effective in increasing or restoring overall transcript levels in the hippocampus and male cortex while GH infusions were more effective in the female cortex.

Conclusions: The Hbb transcript is robustly regulated by GH administration. Other transcripts were regulated by GH to a lesser degree but differently comparing hippocampus and cortex and in females and males. These effects probably have implications for normal cognitive physiology as well as for brain injuries. Further studies addressing different modes of GH-treatment in injuries are therefore warranted.

Keywords: growth hormone; mode of administration; sex; transcript; polymerase chain reaction