



Title: **Hypothermia after traumatic brain damage: Mere (or more than) neuroprotection? Therapeutic potential of combining brain cooling with neurosurgical treatment in translational animal models.**

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Abstract:

In the last decades, therapeutic hypothermia has been esteemed as a very promising strategy to protect the damaged brain from secondary injury. Positive effect of cerebral hypothermia is executed via limiting the energetic demand of the neuronal cells and interfering with inflammatory changes, that may lead to excessive cell necrosis resulting in neuronal loss. Also the apoptotic self-destruction of neurons seems to be halted by decrease of brain temperature. Moreover, recent findings demonstrate that hypothermia, if applied to nervous tissue is able not only to protect the injured neurons from perishing, but also promotes several mechanisms aimed at regaining the function and structure of the damaged brain. Here, induction of neuronal sprouting and synaptic regeneration as positive effect of cooling and hibernation has been described.

However, some results of clinical trials demonstrated, that the beneficial influence of hypothermia might be outweighed by its systemic side effects, if cerebral hypothermia is achieved by lowering the temperature of the whole body. Here, several concepts of focal brain cooling as a valid method to induce neuroprotective and neurorestorative effects of hypothermia need to be recalled. This lecture will demonstrate the Author's concept of selective brain hypothermia, its feasibility in animal model and potential of translation into clinical practice. In particular, the previous results will be critically discussed in regard to the potential of protection from neuronal cell loss and to fostering the neurorestorative mechanisms.