

Tang C, Zelenak C et al, 2011 - Hydration-sensitive gene expression in brain.



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Rationale

Dehydration profoundly influences mental performance, neuroexcitability and possibly survival of neurons. The molecular neuronal mechanisms sensitive to dehydration remained, however, incompletely understood. The present study addressed the effect of water deprivation on gene expression in the brain. To this end, mice were exposed to a 24 hours deprivation of drinking water and neuronal gene expression was determined by microarray technology with subsequent confirmation by RT-PCR and partially Western blotting.

Key Findings

Water deprivation was followed by alterations of cerebral gene expression. Specifically dehydration upregulated the transcript levels of clathrin (light polypeptide Lcb), serum/glucocorticoid-regulated kinase (SGK) 1, and protein kinase A (PRKA) anchor protein 8-like. Water deprivation led to downregulation of janus kinase and microtubule interacting protein 1, neuronal PAS domain protein 4, thrombomodulin, purinergic receptor P2Y - G-protein coupled 13 gene, gap junction protein beta 1, neurotrophin 3, hyaluronan and proteoglycan link protein 1, G protein-coupled receptor 19, CD93 antigen, forkhead box P1, suppressor of cytokine signaling 3, apelin, immunity-related GTPase family M, serine (or cysteine) peptidase inhibitor clade B member 1a, serine (or cysteine) peptidase inhibitor clade H member 1, glutathion peroxidase 8 (putative), discs large (Drosophila) homolog-associated protein 1, zinc finger and BTB domain containing 3, and H2A histone family member V. In conclusion, water deprivation influences the transcription of a wide variety of genes in the brain, which may participate in the orchestration of brain responses to water deprivation.

Relevance for healthy hydration

The observations provide novel insight into the molecular consequences of inadequate hydration. They help to understand, how inadequate hydration could possibly affect mental performance, neuroexcitability and possibly survival of neurons. An influence on neuronal survival would have lasting effects on mental health. Future studies are required to bridge the molecular knowledge to the phenomenology of the interaction between hydration status and brain function.

Tang C, Zelenak C, Völkl J, Eichenmüller M, Regel I, Fröhlich H, Kempe D, Jimenez L, Le Bellego L, Vergne S, Lang F. Hydration-sensitive gene expression in brain. Cell Physiol Biochem. 2011;27(6):757-68. Epub 2011 Jun 17.