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In hydrocephalus, do protein alterations correlate with gene expression?

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Background

Differences in gene expression between non-hydrocephalic and hydrocephalic rats have previously been studied [1], although no studies have been performed on these isolated genes to determine if there is a corresponding alteration in the proteins they encode. It is important to examine if these alterations equate to equivalent changes in protein levels, as proteins are responsible for carrying out the many different functions of the body. The purpose of this study was to examine proteins and their expression levels, and how they relate to the corresponding genes already identified having altered expression levels in the H-Tx rat model in the presence of hydrocephalus. This will allow us to have a better understanding of the pathophysiology of hydrocephalus, and potentially develop protein therapies which are more palatable than traditional genetic therapies.

Materials and methods

The midbrain section from five day old control non-hydrocephalic and hydrocephalic H-Tx rats previously procured and stored in the -80 freezer were utilized in these experiments. Brains were homogenized and subjected to standard SDS-PAGE electrophoresis, followed by Western blotting techniques. Membranes were probed for proteins (tumor necrosis factor (TNF), paired box homeotic gene-6 (PAX6), cholecystokinin (Cck), nuclear factor 1/x (Nfix), lectin galactose binding soluble 3 (Lgals3), glutathione-S-transferase alpha type Y (Gast1), xanthine dehydrogenase (Xdh), and tissue factor pathway inhibitor 2 (Tfpi-2). Protein levels were analyzed utilizing Bio Image Systems software program.

Results

Preliminary data suggest that protein levels do not directly correlate with genetic expression. Testing with two of the aforementioned antibodies indicate that the opposite is true. With TNF, genetic expression was increased 1.59 times, while protein expression was down regulated 1.99 times when comparing the control animals to the hydrocephalic animals ($p < 0.05$). With PAX6 the same trend was found, genetic expression was down regulated by 1.51 times, while protein levels in the midbrain increased 2.2 times ($p < 0.05$).

Conclusion

Overall, our data suggest that there is an inverse relation between gene expression and protein levels. Further studies will solidify the relationship of the aforementioned genes to their proteins. Dependant on these data, proper therapies may be able to be devised to reduce the prevalence of hydrocephalus.

References

1. Miller JM, Kumar R, McAllister JP 2nd, Krause GS: **Gene expression analysis of the development of congenital hydrocephalus in the H-Tx rat.** *Brain Res* 2006, **1075**:36-47.