Cerebrospinal Fluid Research

BioMed Central

Oral presentation

Open Access

Long-lasting hydrocephalus in *hyh* mutant mice: gain and loss of a brain surviving hydrocephalus

Esteban M Rodríguez*[1], Patricia Páez[2], Federico Bátiz[1], Carolina Wagner[1], Karin Vío[1], Antonio J Jiménez[2], Sara Rodríguez[1], Ruth Roales-Buján[2], Luis M Rodrígez-Pérez[2] and José-Manuel Pérez-Fígares[2]

Address: [1]Instituto de Histología y Patología, Universidad Austral de Chile, Valdivia, Chile and [2]Departamento de Biología Celular, Facultad de Ciencias, Universidad de Málaga, Málaga, España, Instituto de Histología y Patología, Universidad Austral de Chile, Valdivia, Chile

Email: Esteban M Rodríguez* - erodrigu@uach.cl

* Corresponding author

from 50th Annual Meeting of the Society for Research into Hydrocephalus and Spina Bifida
Cambridge, UK. 30 August – 2 September 2006

Published: 21 December 2006

Cerebrospinal Fluid Research 2006, **3**(Suppl 1):S15 doi:10.1186/1743-8454-3-S1-S15

Background

A population (30%) of hydrocephalic *hyh* mutant mice develop a slowly progressive hydrocephalus and survive for periods ranging between 2 months and 2 years. Certain characteristics of these mice, such as time of onset of hydrocephalus, type of abnormality of CSF dynamics, clinical evolution and survival/death rate, resemble several types of human congenital hydrocephalus. They represent an exceptional animal model to investigate neuropathological and physiopathological aspects of a brain "adapting" to a virtually life-lasting hydrocephalus

Materials and methods

(i) The clinical evolution of more than 3,000 *hyh* mice,(ii) certain cellular and molecular aspects involved in the pathogenesis of hydrocephalus of several hundreds of embryos and postnatal *hyh* specimens and, (iii) the neuropathology of more than one hundred hydrocephalic mice with arrested hydrocephalus have been investigated with a large series of techniques.

Results

The events occurring in the brain of aging hydrocephalic mice may be regarded as loss and gain. *Loss:* Neuroepithelium/ependyma denudation is a severe loss, since it leads to (i) Sylvius aqueduct obliteration and severe hydrocephalus; (ii) abnormal development of certain populations of cerebral neurons resulting in a permanent neurological impairment. Abnormalities in the subcommissural organ contribute to the development of hydrocephalus and to changes in the protein composition of CSF. Severe alterations of hypothalamus lead to neuroendocrine deficiencies. *Gain*: (i) A subpopulation of astrocytes responds to denudation by repairing the denuded areas forming an ependymal-like new barrier. (ii) Once severe hydrocephalus has been turned on, two ependymal populations located in the aqueduct and third ventricle start to proliferate allowing the large expansion of these cavities. This ependymogenesis continues for several weeks after birth. (iii) All mice surviving hydrocephalus developed spontaneous ventriculostomies.

Conclusion

(i) Essential events of the hydrocephalic phenomenon occur at a rather well defined temporal and spatial pattern in which a program of sequential events may be envisaged. (ii) None of the pathological events should be regarded as the result of mechanical phenomena. Rather, abnormalities occurring at molecular and cellular levels and leading to ependymal denudation and abnormal neurogenesis, precede the onset of hydrocephalus. (iii) Postnatal ependymogenesis and spontaneous ventriculostomies are essential for the hydrocephalic mice to live a long life.

Grants
Fondecyt 1030265, Chile to EMR; FIS PI 030756, Red CIEN (C/0306), SAS, Spain to JMP-F.