Using animal models to study cognitive and psychiatric comorbidities of epilepsy

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Spatial cognition and memory

Morris Water Maze

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Spatial navigation impairment in patients with refractory temporal lobe epilepsy: Evidence from a new virtual reality-based task

Rosa Cánovas a, Irene León a, Pedro Serrano b, Mª. Dolores Roldán a, José Manuel Cimadevilla a,⁎

Liu et al., J Neurosci, 2003
Impaired function of hippocampal place cells in animals with epilepsy

Memory impairments in animals with epilepsy

Lenck-Santini P and Holmes G. J. Neurosci 2008

Liu et al., J Neurosci, 2003
Depression (30-50% of epilepsy patients)

Depression in animals with epilepsy

Forced swim test

Mazarati et al., Brain, 2008
Serotonin and norepinephrine

Mazarati et al., Brain, 2008; Pineda et al., Neuropsychopharmacol, 2011

Serotonin current: raphe-PFC
Norepinephrine current: locus coeruleus-PFC
Autism (1/3 of patients develop epilepsy)

Impaired social interaction, communication and restricted behaviour
Viral infections during pregnancy as a risk factor for autism in children

Autism After Infection, Febrile Episodes, and Antibiotic Use During Pregnancy: An Exploratory Study

WHAT’S KNOWN ON THIS SUBJECT: It has been suggested that maternal immune activation during pregnancy is associated with cardinal behaviors of autism in the offspring. Epidemiologic

ORIGINAL PAPER

Maternal Infection Requiring Hospitalization During Pregnancy and Autism Spectrum Disorders

Hjördis Ó. Atladóttir · Poul Thorsen · Lars Østergaard · Diana E. Schendel · Sanne Lemcke · Morsi Abdallah · Erik T. Parner
Viral infection
Pregnant mouse
Offspring
Autism
Epilepsy
Infection → \( \text{IL} - 6 \) → Autism

Pregnant mice (blood, placenta) → Offspring

\( \text{IL} - 1 \) → Epilepsy

Siltuximab

Canakinumab

Smith et al., J Neurosci, 2007
Pineda et al., Annals of Neurology, 2013
• Animal models allow reproducing not only epileptic seizures, but also various psychiatric, cognitive and behavioural abnormalities associated with epilepsy

• Animal models allow gaining insight into mechanisms of comorbidities using approaches and techniques that are prohibitive in patients

• Causes and mechanisms parallel those suggested for human disorders

• Based on effectiveness and safety data, animal studies narrow down the selection of candidates for, and improve the cost-effectiveness of preclinical trials of novel diagnostic, preventive and therapeutic tools