Rodent model

Rodents (from Latin rodere, “to gnaw”) are mammals of the order Rodentia, which are characterized by a single pair of unremittingly growing incisors in each of the upper and lower jaws. About forty percent of all mammal species are rodents; they are found in vast numbers on all continents except Antarctica. They are the most diversified mammalian order and live in a variety of terrestrial habitats, including human-made environments. There are species that are arboreal, fossorial (burrowing), and semiaquatic. Well-known rodents include mice, rats, squirrels, prairie dogs, porcupines, beavers, guinea pigs, hamsters, and capybaras. Other animals such as rabbits, hares and pikas were once included with them, but are now considered to be in a separate order, Lagomorpha.

Rodent model in neurosurgery

- SARS-CoV-2 (MA10) Infection Aggravates Cerebrovascular Pathology in Endothelial Nitric Oxide Synthase-Deficient Mice
- Effect of Renal Denervation on Early and Late Stages of Diabetic Nephropathy
- Effective Targeting of Glioma Stem Cells by BSJ-04-122, a Novel Covalent MKK4/7 Dual Inhibitor
- Anti-seizure effects of WS-3, a TRPM8 agonist, on focal onset seizure mouse model via reduction of extracellular glutamate levels
- ETMR stem-like state and chemo-resistance are supported by perivascular cells at single-cell resolution
- Coaxial Bioprinting of Schwann Cells and Neural Stem Cells in a Three-Dimensional Microenvironment for the Repair of Peripheral Nerve Defects
- Ectopic expression of GDF15 in cancer-associated fibroblasts enhances melanoma immunosuppression via the GFRAL/RET cascade
- Protective Effect of Resveratrol Against Intracranial Aneurysm Rupture in Mice

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Rodent models of tinnitus are commonly used to study its mechanisms and potential treatments. Tinnitus can be identified by changes in the gap-induced prepulse inhibition of the acoustic startle reflex (GPIAS), most commonly by using pressure detectors to measure the whole-body startle reflex (WBS). Unfortunately, the WBS habituates quickly, the measuring system can introduce mechanical oscillations and the response shows considerable variability.

Wallace et al. have instead used a motion tracking system to measure the localized motion of small reflective markers in response to an acoustic startle reflex in guinea pigs and mice. For guinea pigs, the pinna had the largest responses both in terms of displacement between pairs of markers and in terms of the speed of the reflex movement. Smaller, but still reliable responses were observed with markers on the thorax, abdomen and back. The peak speed of the pinna reflex was the most sensitive measure for calculating GPIAS in the guinea pig. Recording the pinna reflex in mice proved impractical due to removal of the markers during grooming. However, recordings from their back and tail allowed us to measure the peak speed and the twitch amplitude (area under curve) of reflex responses and both analysis methods showed robust GPIAS. When mice were administered high doses of sodium salicylate, which induces tinnitus in humans, there was a significant reduction in GPIAS, consistent with the presence of tinnitus. Thus, measurement of the peak speed or twitch amplitude of pinna, back and tail markers provides a reliable assessment of tinnitus in rodents [1)]

As rodents are not suitable for comprehensive electroencephalography (EEG) investigation via scalp or subdural electrodes recording because of their very small head, a larger primate model that closely recapitulates symptoms of patients with Temporal Lobe Epilepsy (TLE) is needed, and here we describe a rhesus monkey model resembling chronic TLE.

Young male adult rhesus monkeys received delayed kainic acid (KA) injections in their right amygdala via an ommaya reservoir. Additionally, bilateral subdural electrodes were implanted over the parietal-temporal lobes for further electrophysiology investigation, and multiple KA injections were given with continuous video-scalp EEG monitoring.

Monkeys developed spontaneous recurrent seizures (SRSs) that showed little motor clinical signs but symptoms mimicking temporal lobe absence appeared several weeks after KA injection. Both interictal spikes and onset of ictal discharges indicated a primary epileptic zone in the right temporal region and secondary discharges were detected later.

Through a modified protocol of unilateral repetitive intra-amygdala KA injection, a rhesus monkey model with high similarity to chronic TLE was developed.

Results indicated that acute convulsive status epilepticus were not necessary for developing a chronic epilepsy condition in rhesus monkey. And after KA injection, animals showed a progressive nature characterized by secondary discharges [2].

Rodent models are numerous as well but are not as useful as primate models and not comparable with SAH in humans [3] [4].

The validity of using MRI to show infarction in rodents was studied using a middle cerebral artery occlusion model by various working groups [5] [6].

Books

Experimental Neurosurgery in Animal Models (Neuromethods) From Humana Press

This volume provides a full explanation and technical details to perform surgical techniques properly on small and large animal models. The first six chapters of Experimental Neurosurgery in Animal Models focus primarily on the brain, while the next six chapters concern the spinal cord in rodents. The last four chapters provide a description of operative procedures in large animals. Written for the popular Neuromethods series, chapters include the kind of detail and key implementation advice that ensures successful results in the laboratory.

Authoritative and practical, Experimental Neurosurgery in Animal Models aims to ensure successful results in the further study of this vital field.

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