Mutations in the SCN1A gene, which encodes the α1 subunit of voltage-gated sodium channels, cause generalized epilepsy with febrile seizures plus (GEFS+) and severe myoclonic epilepsy of infancy (SMEI). N1417H-Scn1a mutant rats are considered to be an animal model of human FS+ or GEFS+. To assess the pharmacologic validity of this model, we compared the efficacies of eight different antiepileptic drugs (AEDs) for the treatment of hyperthermia-induced seizures using N1417H-Scn1a mutant rats.

The effects of AEDs were evaluated using the hot water model, which is a model of experimental FS. Five-week-old rats were pretreated with each AED and immersed in water at 45℃ to induce hyperthermia-induced seizures. The seizure manifestations and video-electroencephalographic recordings were evaluated.

Diazepam and potassium bromide showed potent inhibitory effects against hyperthermia-induced seizures in the Scn1a mutant rats, whereas carbamazepine exhibited adverse effects. These responses to hyperthermia-induced seizures were similar to those in patients with GEFS+ and SMEI. N1417H-Scn1a mutant rats may, therefore, be useful for testing the efficacy of new AEDs against FS in GEFS+ and SMEI patients.