Neuroscience 211 (2012) 1

NEUROSCIENCE DISEASE MODELS

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This article is part of a Special Issue entitled: Neuroscience Disease Models.

Although the last decade has witnessed unprecedented progress in the use of noninvasive methods to assess brain structure and function, there remain obvious ethical and practical barriers to accessing the living human brain "in action." Hence neuroscientists still have to rely on animal models in 2012 to understand brain physiology and pathophysiology.

Human neurological and psychiatric disorders can be modeled in animals by using standardized procedures that recreate diseases' pathogenic signatures and/or their phenotypic manifestation with variable degrees of face validity. In addition to providing an indispensable platform for basic research on pathogenic mechanisms of disease and the identification of new therapeutic targets, animal models support the discovery of new therapies for neurological and psychiatric disorders by allowing preclinical evaluation of drugs before their trial in patients. In both cases, the challenge is to develop predictive models that faithfully recapitulate the disorder. Articles in this issue of Neuroscience illustrate the often necessary trade off to be made between models that reproduce cardinal pathological features of the disorders through mechanisms that may not necessarily participate to pathogenesis in humans patients vs. models that are based on known pathophysiological mechanisms but only partially reproduce the symptomatic manifestation of the disease in patients.

The reviews compiled in this issue describe efforts to reproduce neurological disorders such as Parkinson's disease and levodopa-induced dyskinesia, multiple system atrophy, Huntington's disease, pain syndromes, and psychiatric conditions such as addiction to drug of abuse, eating, stress, and obsessive compulsive disorders, as well as schizophrenia in a variety of animal models. Space limitations precluding exhaustivity, a number of models for neurological and psychiatric diseases had to be omitted from this compilation. Choice was made to primarily emphasize the variety of approaches and species currently used in the laboratory and to underline classic roadblocks faced by investigators in developing and validating refined models. New opportunities emerge (i) for mammalian genetic models with the development of transgenic rats, and even primates (Dehay et al., 2012), (ii) with a wider range of non-mammalian models, and (iii) with unprecedented efforts for phenotyping large animal populations for identifying spontaneous models of neurological and psychiatric conditions. The development of animal models of neurological/psychiatric disorders is a work in progress with significant progress ahead of us and will continue to fuel new discoveries for novel therapeutics.

REFERENCE

Dehay B, Dalkara D, Dovero S, Li Q, Bezard E (2012) Systemic scAAV9 variant mediates brain transduction in newborn rhesus macaques. Sci Rep 2:253.

0306-4522/12 $36.00
http://dx.doi.org/10.1016/j.neuroscience.2012.04.022