Brain tumors represent one of the most devastating and difficult to treat cancers. Because of the infiltrating nature of the disease, surgical approaches to treatment have not been as successful as hoped. The use of animal models, primarily mice and rats, is considered critical to the study of fundamental brain tumor biology and in understanding therapeutic response to novel therapies. The significance of animal models to brain cancer research is demonstrated by the National Institute of Neurological Disorders and Stroke establishing a working group on Experimental Models for Brain Tumors in 2005 to make recommendations for guiding the institute in its funding priorities (1). This working group identified two significant needs for the research community related to imaging: the creation of genetically accurate animal models and methods to validate, compare and contrast the animal model to the human counterpart. Meeting these two goals was considered critical by the group for translating work carried out in mice with eventual human applications.

The genetic makeup of the brain tumor model is critical to simulation of the human disease. Mouse models have proven by far to be the most versatile in mimicking the human condition (2,3), although there are significant challenges in ultimately translating work in mice to man. Part of the challenge is that even the pathological classification of primary brain tumors can be complicated, resulting in a wide variance of molecular characteristics (4). Both xenograft (3) and spontaneously generated mouse models are available (5). These models have been show to be robust to imaging and for screening new targeted therapies. However, they differ in their biological development from native glial or astrocyte derived tumors. Therefore, genetically engineered mice (GEM) have become popular for creating spontaneously developing tumors that better mimic the progression of natural disease.

While not as prevalent as mouse models, several rat models exist (6) and are particularly useful where the size of the animal, and therefore the maximum tumor burden, are important. For example, in studies of radiation and/or radiation-drug combinations, the larger size of the rat is advantageous in mimicking the radiation dose distributions (7).

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References
1. www.ninds.nih.gov/find_people/groups/brain_tumor_prg/Models.htm