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Animal Models of Glioma

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Gliomas are the most common primary tumors that arise from glial cells and their precursors in the central nervous system. Animal models always are important tools in the study of tumorigenesis, various therapies or preclinical trials for gliomas. It has been known since the 1970s that repetitive intravenous administration of nitrosourea compounds such as methynitrosourea (MNU) and N-ethyl-N-nitrosourea (ENU) produces glial-type neoplasms in immunocompetent rats. However, the long time required to induce neoplasms, and inconsistency of tumor development, led to a shift towards implantation of neoplastic cells propagated in vitro. Implantation of rodent glioma cells has proven an excellent intracranial brain tumor model due to their efficient tumorigenesis, reproducible and fast growth rates and accurate knowledge of the tumor location. Over the past few decades, several mouse glioma models have been generated based on human genetic abnormalities and the induced gliomas exhibit histological similarities to their human counterparts. More accurate animal models are required for research on the molecular and genetic bases of this disease. Here we expand on the existing animal models for gliomas with different strategies.

While there exist a multitude of methods for introducing glial-type neoplasms into the rodent central nervous system (CNS), which histologically mimic human primary tumors, these methods can be described as belonging to one of two groups: 1) Tumors created by methods which do not target a specific gene, and 2) Tumors created by targeted mutation of genes known to be mutated in human tumors.

While the majority of these models involve the use of rodent glioma cells injected in syngeneic hosts, it is also possible to use human glioma cells in vivo via their implantation in athymic mice. We will describe both of the two classes of glioma animal models, and eight commonly used rat brain tumor models and their application for the development of novel therapeutic and diagnostic modalities.

The rat has been one of the most widely used experimental animals, and rat brain tumor models have been used extensively since the mid 1970s. Here we will focus on rat brain tumor models and their utility in evaluating the efficacy of various therapeutic modalities. Until recently, murine models (Fomchenko & Holland, 2006) were used less frequently than murine models (Fomchenko & Holland, 2006).


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