Despite recent therapeutic advances, gliomas, in particular the most frequent and malignant glioblastoma, remain devastating tumors and need a better molecular characterization to improve both classification and treatment. Currently, three molecular markers, related to better outcome, are particularly useful and complement the histological classification: the 1p/19q codeletion strongly predicts prolonged response to treatment and prolonged survival in oligodendroglial tumors; the O (6)-methylguanine-DNA methyltransferase promoter methylation, which is hypothesized to render the cell more vulnerable to alkylants, is associated with a stronger benefit of concomitant chemoradiotherapy in glioblastomas; mutations of the IDH1 (more rarely IDH2) gene affects 40% of gliomas (but 100% of the 1p/19q codeleted gliomas) and is inversely correlated to grade. IDH1 mutation is a strong and independent predictor of survival, whatever grade considered. The consequences of IDH1/IDH2 mutation (that results in a new enzymatic activity transforming alphacetoglutarate into 2-hydroxyglutarate) are currently under investigation. Recently, integrated genomic, transcriptomic and epigenetic studies have unraveled new glioblastoma subgroups that further refines the molecular classification of these tumors. Such an approach should be extended to lower grade gliomas.