Many tumors contain hypoxic regions. Hypoxia, in turn, is known to increase aggressiveness and to be associated with treatment resistance. The two most frequently described and investigated subtypes of tumor hypoxia are acute and chronic. These two subtypes can lead to completely different hypoxia-related responses within the tumor, which could have a direct effect on tumor development and response to treatment. In order to accurately assess the specific biological consequences, it is important to understand which time frames best define acute and chronic hypoxia. This article provides an overview of the kinetics of in vitro and in vivo acute and chronic tumor hypoxia. Special attention was paid to differentiate between methods to detect spontaneous in vivo hypoxia and to describe the biological effects of experimental in vitro and in vivo acute and chronic tumor hypoxia. There are large variations in reported spontaneous fluctuations in acute hypoxia that are dependent on the cell lines investigated and the detection method used. In addition to differing hypoxia levels, exposure times used to induce in vitro and in vivo experimental acute and chronic hypoxia range from 30 min to several weeks with no clear boundaries separating the two. Evaluation of the biological consequences of each hypoxia subtype revealed a general trend that acute hypoxia leads to a more aggressive phenotype. Importantly, more information on the
occurrence of acute and chronic hypoxia in human tumors is needed to help our understanding of the clinical consequences.