Abstract

Angiogenesis, as both a prerequisite of and a major contributor to cancer development, is an attractive therapeutic target for which most treatment modalities in the clinical setting require refinements to tumor specificity and efficacy. Heparin and folic acid can be conjugated into nanoparticles to carry small molecule lipophilic drugs such as sorafenib tosylate, a tyrosine kinase inhibitor targeting the VEGF receptor responsible for angiogenesis. In this investigation, to account for synergistic or impeditive effects of the heparin-folate nanoparticle during sorafenib tosylate administration, both compounds were tested separately for their ability and as a co-treatment to inhibit angiogenesis *in vitro* using human endothelial cell culture. Heparin-folate nanoparticles were observed to inhibit expression of p38 MAPK and synergistically improve the anti-angiogenic properties of sorafenib despite not impeding cell proliferation or angiogenesis directly, suggesting they may be used to enhance the efficacy of sorafenib in clinical settings.

Keywords: angiogenesis, folic acid, heparin, nanoparticles, sorafenib