Challenges with *in vitro* and *in vivo* experimental models of urinary bladder cancer for novel drug discovery

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Expert Opinion on Drug Discovery, Volume 11, 2016 - Issue 6

ABSTRACT

Introduction: Urinary bladder cancer (UBC) is the second most frequent malignancy of the urinary system and the ninth most common cancer worldwide, affecting individuals over the age of 65. Several investigations have embarked on advancing knowledge of the mechanisms underlying urothelial carcinogenesis, understanding the mechanisms of antineoplastic drugs resistance and discovering new antineoplastic drugs. *In vitro* and *in vivo* models are crucial for providing additional insights into the mechanisms of urothelial carcinogenesis. With these models, various molecular pathways involved in urothelial carcinogenesis have been discovered, allowing therapeutic manipulation.

Areas covered: This paper provides critical information on existing *in vitro* and *in vivo*models to screen the efficacy and toxicity of innovative UBC therapies and point out the challenges for new and improved models.

Expert opinion: In our opinion, results obtained with *in vitro* and *in vivo* models should be interpreted together, as a set of delicate biological tools that can be used at different stages in the drug discovery process, to address specific questions. With the development of new technologies, new assays and biomarkers are going to play an important role in the study of UBC. The molecular diagnostics and genomic revolution will not only help to develop new drug therapies, but also to achieve tailored therapies.

KEYWORDS: Animal models, antineoplastic drugs, cell culture, treatment, tumor, urothelial