Docket #: S13-498

BMP Activators for Treating Bladder Cancer and Other Tumors

Low doses of agents that activate BMP signaling (such as FK506) could be used to prevent the progression of bladder cancer and potentially treat breast, colon and other types of epithelial-derived cancer. This technology is based on the discovery by Prof. Philip Beachy and colleagues that *Sonic hedgehog (Shh)* protein expression is lost in invasive bladder tumors. Furthermore, because *Shh* usually activates the BMP pathway in the bladder lining, external agents that artificially activate BMP signaling can prevent tumor invasion and growth. This therapeutic strategy could help curtail progression of early stage bladder cancer and prevent the invasive form that is expensive to treat and largely incurable. This method may also prove useful for other cancers that are impacted by BMP pathway activity.

Stage of Research
The inventors have demonstrated that low dose FK506 (tacrolimus) treatment protected mice from invasive bladder cancer.

Applications

- **Cancer therapy** - treatment for bladder and other epithelial-derived cancer (such as lung, pancreas, colon, breast or skin cancer) using agents that activate BMP
- **Drug repositioning** - using existing BMP activators such as FK506 for cancer indications

Advantages

- **Known safety profile:**

    - existing BMP activators (such as FK506) have been approved by the FDA for use in humans
    - low-dose treatment with FK506 can activate the BMP pathway with minimal immunosuppression
- **Reduced treatment costs** - treatment with BMP could have significant impact on clinical management of bladder cancer due to the high rate of recurrence and progression that necessitates ongoing monitoring

Publications

- Shin, K., Lim, A., Zhao, C., Sahoo, D., Pan, Y., Spiekerkoetter, E., ... & Beachy, P. A. (2014). Hedgehog signaling restrains bladder cancer progression by eliciting stromal production of urothelial differentiation factors. *Cancer Cell*, 26(4), 521-533.
- Methods for Treating Cancer by Activation of BMP Signaling (PCT Application, Publication No. WO2015073691)

Patents

- Published Application: WO2015073691
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