

## Inhibitor of VEGF for Treatment of Cancer

Solid tumors account for majority of the incidences of cancer in adults and constitute over 30% of pediatric cancers worldwide. Among the different types of solid tumors, breast cancer is the most common cancer for women and represents 15% of all new cancers in the US. According to the National Cancer Institute in 2017, there were over 252 thousands new incidences of breast cancer and it resulted in death of 40 thousand women. Although there are multiple therapeutic agents targeting breast cancer they often have negative side effects such as toxicity, termination of healthy cells due to non-specific effects and development of drug resistance in cancer cells. Therefore, there is a need for new therapeutic agents for the treatment of solid tumors. One of the strategies used to inhibit growth of solid tumors is to inhibit the tumor's blood supply. Researchers at NSU have developed and tested a novel compound that blocks VEGF (Vascular Endothelial Growth Factor) receptors, which leads to inhibition of growth of blood vessels. This inhibition of tumor angiogenesis will thus destroy the tumor by constraining its blood supply.

### Technology

Dr. Appu Rathinavelu and his research team at NSU has developed a novel anti-cancer molecule, JFD that is capable of exerting antiangiogenic effects by blocking VEGF receptor 2, which is necessary for the development of new blood vessels in a solid tumor such as breast cancer. In studies conducted at the Rumbaugh-Goodwin Institute for Cancer Research, JFD demonstrated both anti-angiogenic and pro-apoptotic effects against solid tumors. This novel compound showed promising anticancer effects in both cell culture and in vivo studies and demonstrated relatively less toxicity when compared with known anticancer drugs. The results of studies on breast cancer xenograft mouse model indicated that JFD has significant anticancer effects owing to its anti-angiogenic properties and its tumor inhibitory properties were comparable to a commonly used chemotherapeutic agent, Paclitaxel (Taxol). Moreover, in this mouse model study, JFD exhibited much less toxicity compared to Taxol. In xenograft studies, JFD proved to be efficient in inhibiting tumor growth when used by itself or as a combination therapy with Paclitaxel. When both JFD and Taxol was used as a combination therapy in an in vivo study, it not only resulted in 85% tumor suppression but did not produce any toxicity that is often associated with Taxol monotherapy. The findings of these studies offer substantial evidence supporting efficacy of JFD as a potent anticancer therapeutic agent.

### Application

This antiangiogenic drug can be used as a therapy for breast cancer and other solid tumors either by itself or in combination with currently used chemotherapeutic agents such as paclitaxel (Taxol).

### Advantages/Benefits

In a pre-clinical study on xenograft mouse model for breast cancer, JFD demonstrated anticancer properties comparable to the well-known chemotherapeutic agent, Taxol. However, it did not exhibit significant toxicity, which is experienced by cancer patients receiving chemotherapy.

JFD was successful in inhibiting solid tumors when used as a monotherapy as well as when used in combination with established cancer drug such as Taxol.

## Status of Development

- The anti-cancer properties of JFD has been established in both cell culture and breast cancer xenograft mouse model
- JFD has been modified to water-soluble salt form, which has resulted in improved bioavailability and distribution in pre-clinical *in vivo* studies
- The researchers are currently investigating JFD's therapeutic potential against other types of cancers besides breast cancer. NSU is currently looking for partners to further develop this therapy and initiate clinical trials in human subjects.

## Patent Status

US Patent 7,875,603 issued 25 Jan 2011.

Japanese Patent 5436544 issued 20 Dec 2013.

Korean Patent 10-1538822 issued 16 Jul 2015.

European Patent 8767636.7 issued on 17th August 2016.

Canadian Patent 2723233 issued on 13th June 2017.

## Information on Inventors



- Dr. Appu Rathinavelu—Dr. Rathinavelu is the Executive Director of the Rumbaugh Goodwin Institute for Cancer Research at Nova Southeastern University. He is also a Professor of pharmaceutical sciences at NSU's College of Pharmacy.
- Dr. Nagarajan Pattabiraman—Dr. Pattabiraman is a postdoctoral research scholar at the Rumbaugh Goodwin Institute for Cancer Research at Nova Southeastern University.
- Dr. Sivanesan Dakshanamurthy

## Contact

### Gary Margules, Sc.D.

Vice President of Research  
and Technology Transfer

[margules@nova.edu](mailto:margules@nova.edu)

### Arunodoy Sur, Ph.D.

Technology Licensing Officer

[asur@nova.edu](mailto:asur@nova.edu)

(954) 262-1022

**NSU**  
Florida

NOVA SOUTHEASTERN  
UNIVERSITY

**Office of Research and  
Technology Transfer**

3301 College Avenue  
Fort Lauderdale, Florida  
33314-7796

[nova.edu/ott](http://nova.edu/ott)