**Abstract**

Glioblastoma multiforme (GBM) is a highly malignant brain tumor with almost 100% recurrence rate even after surgery, radiation and chemotherapy. A pigment epithelium-derived factor (PEDF) has been found in areas where these tumors do not grow as aggressively. PEDF slows the growth of tumors by inhibiting angiogenesis, a physiological process involving growth of new capillaries from pre-existing blood vessels in the body.  

**The Inhibitor of Angiogenesis**

- PEDF, a serpin protein, which end to play inhibitory roles of other proteins' functions and chemical reactions.  
- PEDF is highly expressed in the eye's pigmented epithelium and in the brain; also distributed in areas such as the liver, testis, ovaries, placenta and pancreas.  
- In the figure below PEDF proteins inhibit new capillaries from forming, preventing nutrients and oxygen to the tumor.  
- Tumor growth is suppressed.

**PTMs on PEDF**

- **Phosphorylation** Ser24 and Ser114 increase anti-angiogenic activity, while phosphorylation at Ser227 reduces anti-angiogenic activity.
- **Glycosylation** changes are common in tumor progression and malignant transformations. However, the role of PEDF glycosylation in GBM progression has yet to be studied.

**Protein quantification using spectral counting**

- Using this approach of spectral counting, 883±71 proteins are differentially expressed in GBM vs. control epilepsy tissues.

**Peripheral Blood Mononuclear Cells**

- Tissue lysates from GBM biopsies and epilepsy samples are analyzed by mass spectrometry. Proteins identified are quantified based on the number of spectra each protein is identified from.

**Western Blot Analysis of PEDF**

- PEDF is expressed in both GBM (lane 1) and control epilepsy (lane 2) samples. (Epilepsy is the non-tumorous tissue available from the human brain that can act as a control for GBM.)
- The arrow at 50 KDa in the image is pointing to the location where PEDF is identified.
- Multiple bands represent that PTMs have occurred.
- The arrow at 75 KDa represents possible PTMs on PEDF.
- PEDF expression is less in GBM vs. control.
- PTMs on PEDF are possibly different in GBM vs. control.
- Differences in expression levels and PTMs are correlated to GBM tumor progression; studies on these mechanisms are underway.

**Summary**

- GBM is a highly aggressive brain tumor with highly invasive and fast growing properties.
- Through mass spectrometry, it has been identified that proteins are differentially expressed in GBM tumors compared to control epilepsy tissues.
- PEDF protein is found to be down-regulated in samples from GBM compared to controls.
- Western blotting of PEDF identified potential PTMs on the protein.
- PEDF undergoes the PTMs of phosphorylation and glycosylation during various cellular functions.
- Understanding PEDF and its PTMs might lead to new therapeutics for GBM.
- The mechanism of these PTMs and their role in GBM progression will be studied further by researchers.